AUTOMOTIVE INDUSTRIES

AUTOMOTIVE and AVIATION MANUFACTURING
ENGINEERING • PRODUCTION • MANAGEMENT

JUNE 15, 1957

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Production Techniques at Ford's Sterling Plant
An Engineering Analysis of the Indianapolis "500"
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A CHILTON PUBLICATION

Heald announces TWO NEW DEVELOPMENTS

THE NEW "RITE-ANGLE" CENTRI-MATIC



Clifford G. Menard
Chief Engineer,
Grinding Division

ANY new development that can cut grinding time by up to 50 per cent is important news. And since our new RITE-ANGLE Centri-Matic internals will do just that, some inside information on how this rather startling improvement was brought about may be of interest.

In order to permit heavier feeds and faster stock removal, we have *inclined* the wheelhead table at a 30 degree angle — to oppose feeding and grinding forces to best advantage.

With this new RITE-ANGLE construction, stock can now be removed at the rate of two cubic inches per minute without any distortion or unwanted movement of the table, keeping the wheel properly buried in the work. This compares to a previous maximum stock removal of about 1 cubic inch per minute.

The Model 190A and 1901A Centri-Matics utilize a new cycle and compensating diamond arrangement, especially designed to take full advantage of the faster feeds and automatically maintain optimum grinding intervals under varying conditions of work size and stock removal. Spindle pressure against the work during all portions of the grinding cycle is measured by an ammeter on the control panel, permitting proper roughing and finishing pressures to be established during the set up. The feed box controls will automatically maintain these pressures during the production cycle.

The RITE-ANGLE design can be likened to an iron hand in a velvet glove — giving greater strength where strength is needed, yet retaining the extremely high precision that is so essential to bearing race work.

THE NEW "UNIT-TYPE" BORE-MATIC



John J. McCabe
Chief Engineer,
Bore-Matic Division

THE unitized or "building-block" design has been applied to large automated machine tool equipment with considerable success. And now, with the development of the new Model 0 Unit-Type Bore-Matic, we have applied this same basic principle to a small, individual machine, with some very interesting results.

Designed around a number of standard, interchangeable units or "building blocks," the Model 0 is actually many machines in one — providing far greater versatility and economy than have ever before been available in a high-precision machine of this type. It can be arranged as a single or double end machine, with one or two boringheads or a multi-spindle unit at either or both ends. Hence it puts custom-built machine design on an "off-the-shelf" basis, meeting the exact requirements of any small-work Borizing job.

One of the outstanding features of this machine is a new MULTI-SPINDLE Boringhead that offers the first practical solution to the problem of Borizing multiple holes on close centers. Heretofore this has had to be done, one hole at a time, on large, costly equipment requiring high operator skill. But with the new MULTI-SPINDLE head, any practical number of holes, with centers as close as ¾", can be Borized simultaneously and duplicated again and again with extremely high accuracy. Individual Red Head boringhead spindle units are mounted in interchangeable spindle plates, jig bored to the requirements of each job. This completely flexible clusterhead arrangement puts multi-hole, close-center Borizing on a low cost, production basis.

THE HEALD MACHINE COMPANY • Subsidiary of The Cincinnati Milling Machine Co. • **Worcester 6, Massachusetts**

For further details see Pages 22 and 23

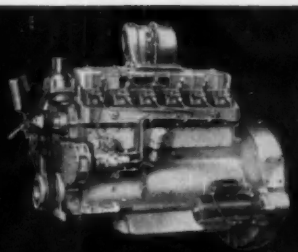
THE PAYLOAD POWER PLANT

- **fast**
- **smooth**
- **powerful**

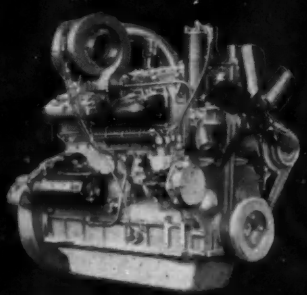
MODEL	Cyl.	*Features	Bore and Stroke	Displ. Cu. In.	Max. Torque @ RPM	Max. HP	RPM
TURBO-SUPERCHARGED DIESELS							
197-DLCS	6	AT	4 x4	320	280-2000	131	2800
135-DKBS	6	ACTV	4⅛x5	426	400-1800	185	2800
148-DKBS	6	ACTV	5¼x6	779	706-1800	280	2100
WAKDBS	6	ACTV	6¼x6½	1197	1062-1600	352	1800
NORMAL DIESELS							
180-DLC	4	AC	3½x3¾	144	102-1800	45	2400
185-DLC	6	A	3½x3¾	216	152-1200	60	2400
190-DLCA	6	AC	3¾x4	265	191-1400	85	2800
195-DLCA	6	AC	4 x4	302	221-1800	98	2800
135-DKB	6	ACV	4⅛x5	426	328-1600	147	2800
148-DKB	6	ACV	5¼x6	779	584-1000	200	2100
WAKDB	6	ACV	6¼x6½	1197	845-1000	258	1800
GASOLINE							
180-GLB	4	AC	3½x3¾	144	118-1600	45	2400
185-GLB	6	A	3½x3¾	216	176-1400	67	2400
190-GLB	6	A	3¾x4	265	220-1200	77	2400
195-GKA	6	ACV	4⅛x4	320	243-1600	122	3000†
MZA	6	A	4¼x4¾	404	289-1000	128	2800†
135-GKB	6	ACV	4¼x5	426	337-1200	147	2800†
135-GZB	6	ACV	4⅜x5	451	354-1200	153	2800†
140-GKB	6	ACV	4½x5½	525	425-1000	177	2600†
140-GZB	6	ACV	4⅝x5½	554	448-1100	188	2600†
145-GKB	6	ACV	5¼x6	779	595-1000	240	2400†
145-GZB	6	ACV	5⅜x6	817	630-1100	250	2400†
WAKB	6	ACV	6¼x6½	1197	1000-1000	280	1800

***FEATURES:** A—Aluminum Alloy Pistons; C—Counterbalanced Crankshaft; T—Turbo-Supercharged; V—Vibration Dampener.

†These engines rated at higher hp and rpm for fire engine service. *Send for Bulletin 1079 for LPG ratings and complete listing of engine hp and speed ratings.*



197-DLCS—Turbocharged Diesel



135-DKBS—Turbocharged Diesel
(Also normally aspirated)



148-DKBS—Turbocharged Diesel
(Also normally aspirated)

WAUKESHA ENGINES

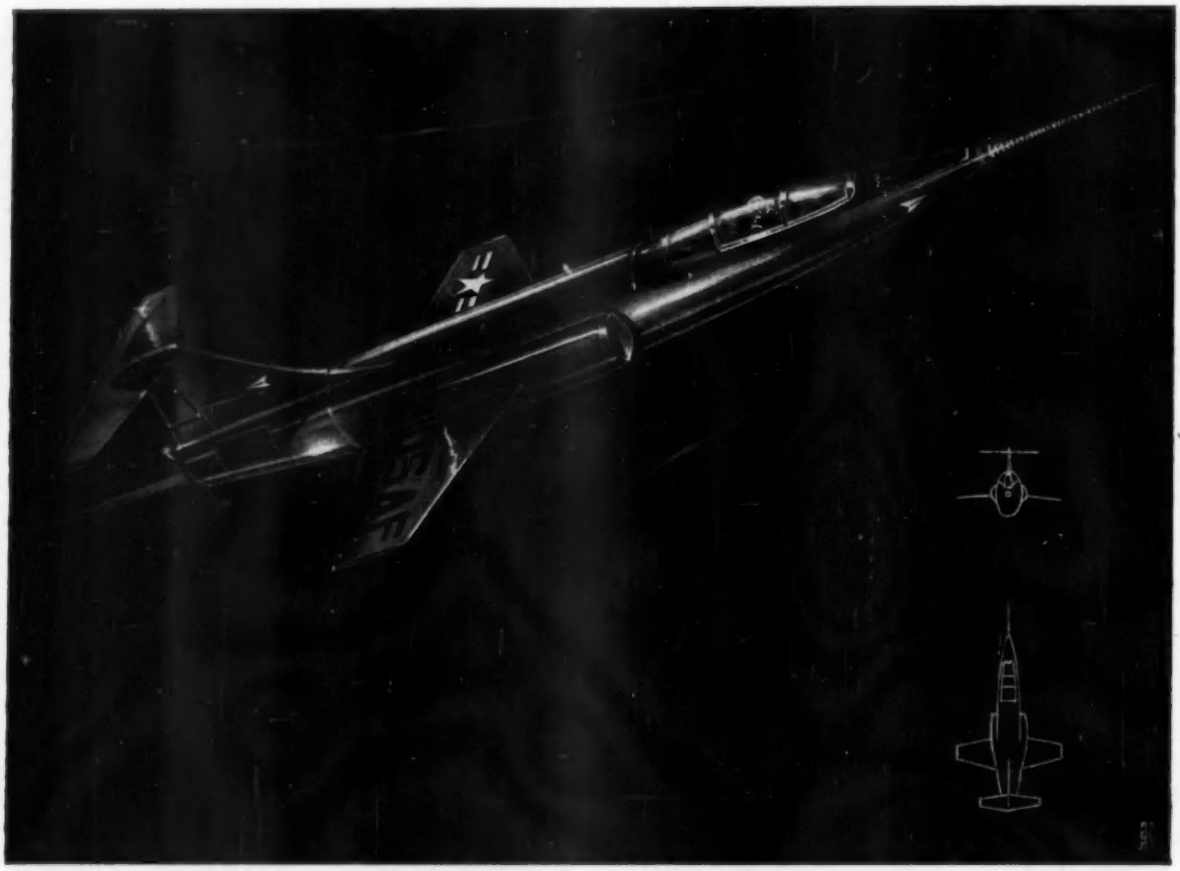
NORMAL and TURBOCHARGED DIESELS . . . GASOLINE . . . LP GAS
Standard or Counterbalanced Crankshafts



Truck powered by Waukesha 148-DKB Normal Diesel

Write for descriptive bulletins
WAUKESHA MOTOR COMPANY
Waukesha, Wisconsin
New York • Tulsa • Los Angeles

349



New Starfighter...full-speed straight up

Nickel alloy that boosts life of her jets may boost performance of gas turbine parts

Lockheed's new Starfighter climbs as fast as she flies ... hurled into the sky by her J-79.

That calls for operation at high temperature . . . a problem designers solved with Incoloy "T" titanium-containing nickel-iron-chromium alloy.

Incoloy "T" alloy gives combustion liners the desired life expectancy. Its performance suggests that it may have interesting possibilities for parts in new automotive systems.

For one thing, it has top-notch heat and corrosion resistance and excellent physicals at temperatures up to 1,600°F. What's more, its nickel content is relatively low. You'll find more details in "Basic Data on Incoloy 'T' Alloy", available from Inco.

Maybe Incoloy "T" or one of the many other Inco Nickel Alloys can help on your problem. Inco's Mechanical Engineering Section will be glad to talk it over. Let's get together soon.

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street New York 5, N. Y.

INCO Nickel Alloys

are marketed under the following trademarks:
MONEL • "R" MONEL • "K" MONEL • "KR" MONEL "S" MONEL • INCONEL • INCONEL "X" • INCONEL "W" • INCONEL "700" • INCOLOY • INCOLOY "T" INCOLOY "901" • NIMONIC Alloys

Where Inco Nickel Alloys are used in jet aircraft

Inconel
Combustion liners
Transition sections
Insulating blankets
Lock wire and rivets
Fuel line tubing

Inconel "X"
Rotor discs
Afterburner bellows
High-temperature bolts
Rocket engine rotors

Nimonic Alloys
Combustion liners
Transition sections
Vaporizer tubes
Turbine blades
Rotor discs

Inconel "W"
Tail cones
Afterburners

Inconel "700"
Turbine blades

Incoloy "T"
Transition sections
Combustion liners

Incoloy "901"
Turbine discs

Monel
Lock wire
Fine fuel line tubing
Rivets

"S" Monel
Ball bearing retainer rings

Pure Nickel for electrical and electronic gear. Primary Nickel as alloying element in other materials. Inco Precision Castings in many different alloys.

AUTOMOTIVE INDUSTRIES

A CHILTON MAGAZINE — PUBLISHED SEMI-MONTHLY

JUNE 15, 1957 — VOL. 116, NO. 12

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SBME Society of Business Magazine Editors
ABC Audit Bureau of Circulations

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"...the most return, dollar for dollar, on our investment"

says RALPH SCULLY, Plant Engineer,
Grinnell Corporation, Cranston, R.I.



Pangborn Continuous-Flo® Barrels pay for themselves in short time at Grinnell

In the manufacture of its quality pipe fittings and pipe hangers, Grinnell Corporation cleans thousands of castings daily in its foundries at Cranston, R.I., and Columbia, Pa. To do this effectively and economically proved a problem. "We investigated all types of cleaning equipment," says Mr. Scully, "and decided the Pangborn Continuous-Flo Barrel lent itself best to our production situation and would give us the most return, dollar for dollar, on our investment. We installed Continuous-Flo Barrels and have been pleased with their performance. Based on continuous operation, cost savings indicate they will pay for themselves in a relatively short time."

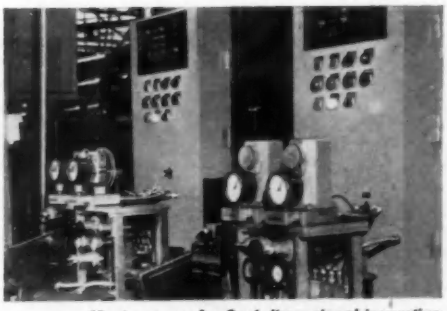
If you have an unusual cleaning problem, Pangborn offers a special service. Pangborn engineers will study your problem and its relation to your production line. Then they will design a machine for your particular needs. Find out now how Pangborn's engineering service can give you better cleaning and faster production at lower cost.

Write today for Bulletin 1210 to PANGBORN CORP., 3900 Pangborn Blvd., Hagerstown, Maryland. *Manufacturers of Blast Cleaning and Dust Control Equipment.*

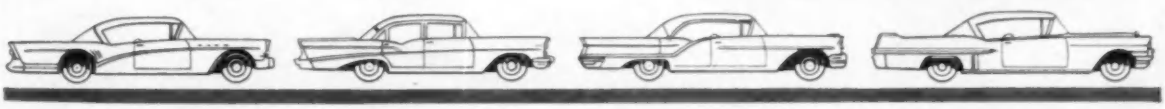
Pangborn blast cleans cheaper

ELECTRONIC QUALITY CONTROL

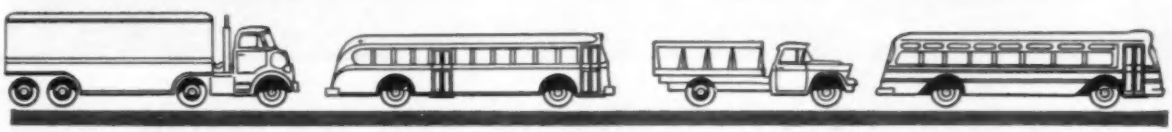
...another reason why we repeat:



Master gages for final dimensional inspection



When you think of tapered roller bearings think of HYATT



Nearly half of all American cars and trucks built today have HYATT Hy-Roll Tapered Bearings

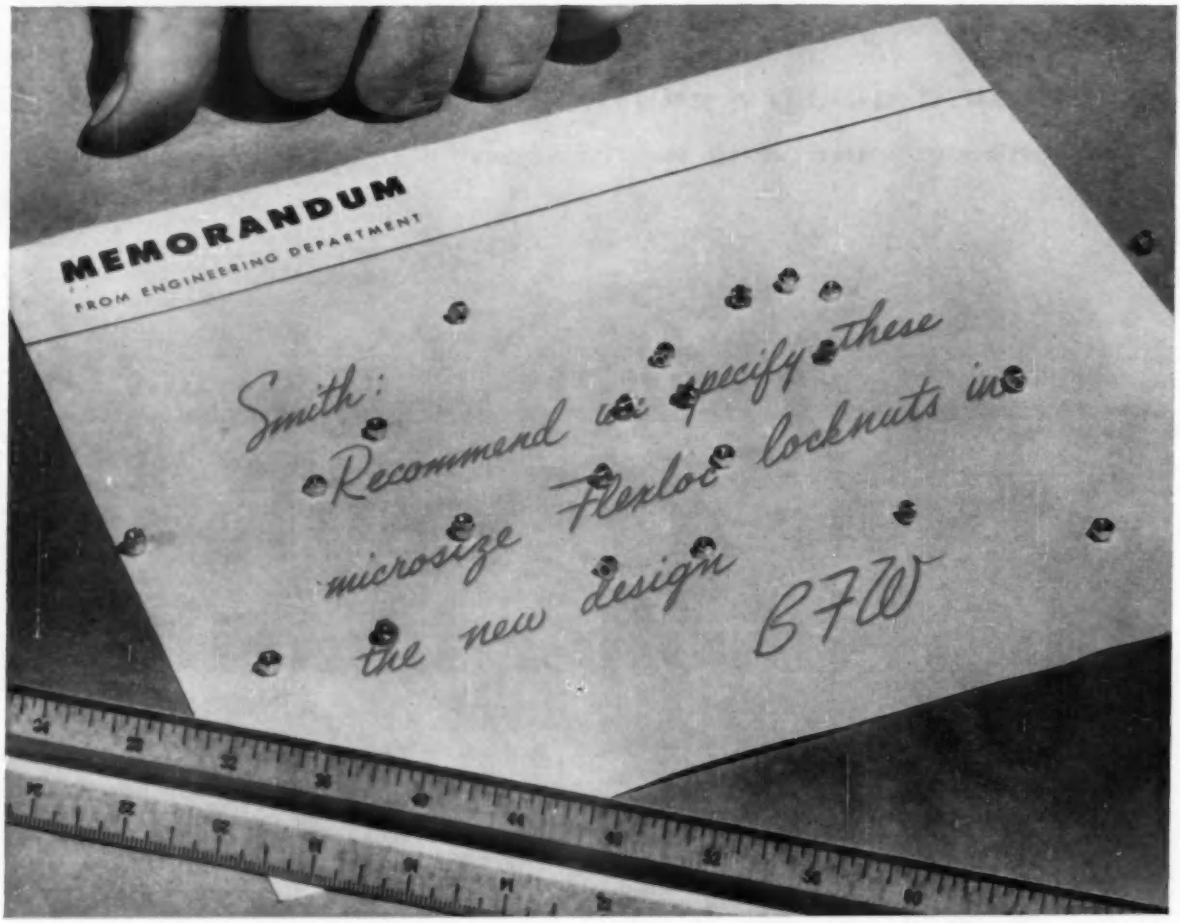


Today there's a *new* standard of quality in tapered roller bearings—*electronic quality control*—and HYATT is establishing it! Modern gauging equipment, with sensitive electronic controls like those shown above, holds every HYATT Tapered Bearing to a degree of uniformity never before achieved in quantity production.

Result: longer, smoother, more dependable performance in your toughest automotive applications. In tapered bearings, too, HYATT means *highest quality!* Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey.

GM GENERAL MOTORS

HYATT HY-ROLL BEARINGS FOR CARS AND TRUCKS



Microsize FLEXLOC locknuts help you design smaller assemblies and fasten them securely

SIZE	Across Flats MAX.	Across Flats MIN.	Hex. Height REF.	Across Corners MIN.	Height REF.
0-80 NF-3B	.111	.107	.046	.121	.075
1-64 NC-3B	.127	.123	.056	.140	.090
1-72 NF-3B	.127	.123	.056	.140	.090
2-56 NC-3B	.158	.153	.067	.176	.105
2-64 NF-3B	.158	.153	.067	.176	.105
3-48 NC-3B	.190	.183	.071	.210	.120
3-56 NF-3B	.190	.183	.071	.210	.120
4-40 NC-3B	.190	.183	.071	.210	.120
4-48 NF-3B	.190	.183	.071	.210	.120

Standard microsize FLEXLOC locknuts are available in brass (plain or cadmium plated) and aluminum (plain or chemically treated) for temperatures up to 250°F; in alloy steel (plain or cadmium plated) and 18-8 stainless steel (silver plated) for temperatures up to 550°F.

STANDARD PRESSED STEEL CO.

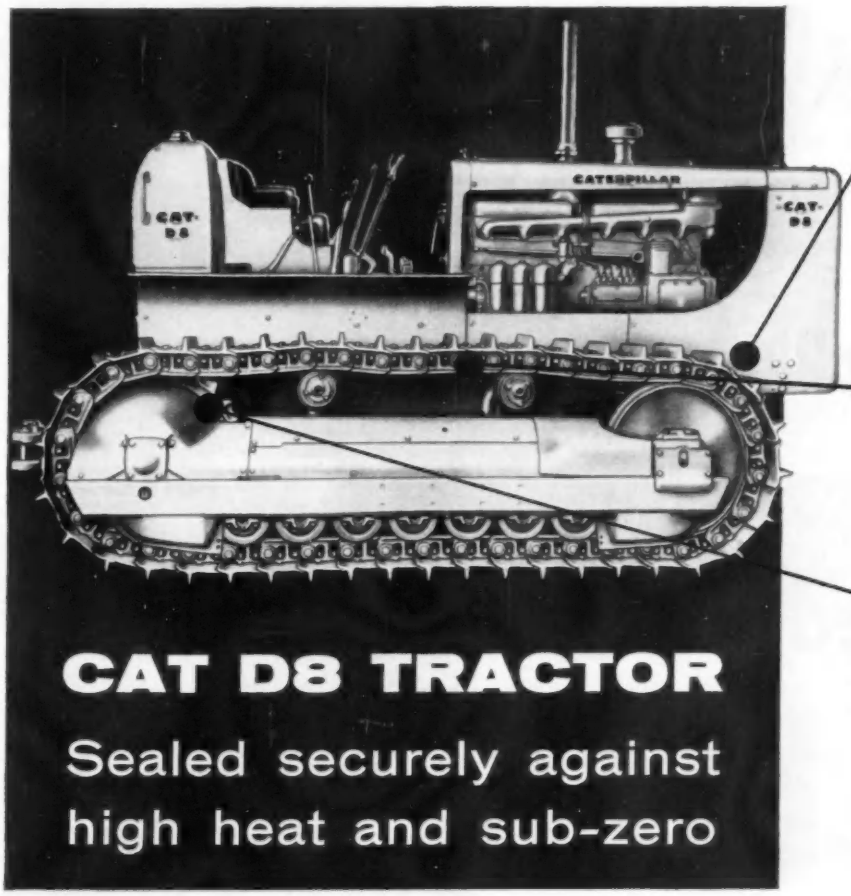
FLEXLOC LOCKNUT DIVISION SPS JENKINTOWN PENNSYLVANIA



Microsize FLEXLOC locknuts save space and reduce weight in electronic equipment, instruments, servomechanisms, and other small assemblies in which weight and bulk are important design considerations. Microsize FLEXLOC locknuts are smaller and lighter than regular FLEXLOCS of the same nominal diameter. They permit smaller mating joints or flanges —with no loss in holding power or convenience of assembly.

Like regular FLEXLOCS, microsize FLEXLOC locknuts are of one-piece, all-metal construction. No inserts to pop out or deteriorate; nothing to put together, come apart or get lost. FLEXLOCS lock and stay locked wherever wrenching stops. You can use them as locknuts or stop nuts. Vibration will not loosen them and they can be used many times over.

For more information on microsize FLEXLOC locknuts (or microsize FLEXLOC self-locking clinch nuts), see your local FLEXLOC distributor or write STANDARD PRESSED STEEL CO., Jenkintown 53, Pa.



CAT D8 TRACTOR

Sealed securely against high heat and sub-zero



Front Crankshaft Seal—Type K-6 dual lip design with high heat- and oil-resisting Victoprene sealing element. Metal O. D. assures perfect press fit.



Rear Crankshaft Split Seal—Two-section Victoprene seal eliminates need of dropping shaft when removing and replacing. Semicircular molded construction integral with frame. Victoprene coating on O.D.



Beveled Gear Shaft and Pinion Seals—Type K-6 dual sealing lip design provides maximum retention of lubricant and exclusion of foreign matter. Spring maintains uniform sealing pressure. Chemically bonded to metal-encased construction.

with Victoprene silicone and polyacrylic compounds

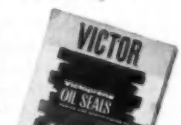
Oil seals, shown above, on the Caterpillar D8 tractor make a clean break with former standards for extreme operating conditions and oil-resistance characteristics. They're specified for the toughest working conditions facing construction and road building machinery.

As fast as your new sealing requirements develop, count on Victor for complete help in meeting each specification. The answer may be in the variety of Victor-developed synthetic compounds and designs with excellent resistance to low and high temperatures.

You can be sure of a modern approach to your problem. At Victor there's never a standstill in searching for better sealing compounds for old and new applications alike.

New Engineering Catalog No. 305 Sent on Request

You'll find much useful data in this 60-page manual on modern oil seal specification procedure. Get a copy from your Victor Field Engineer or write directly to Victor.



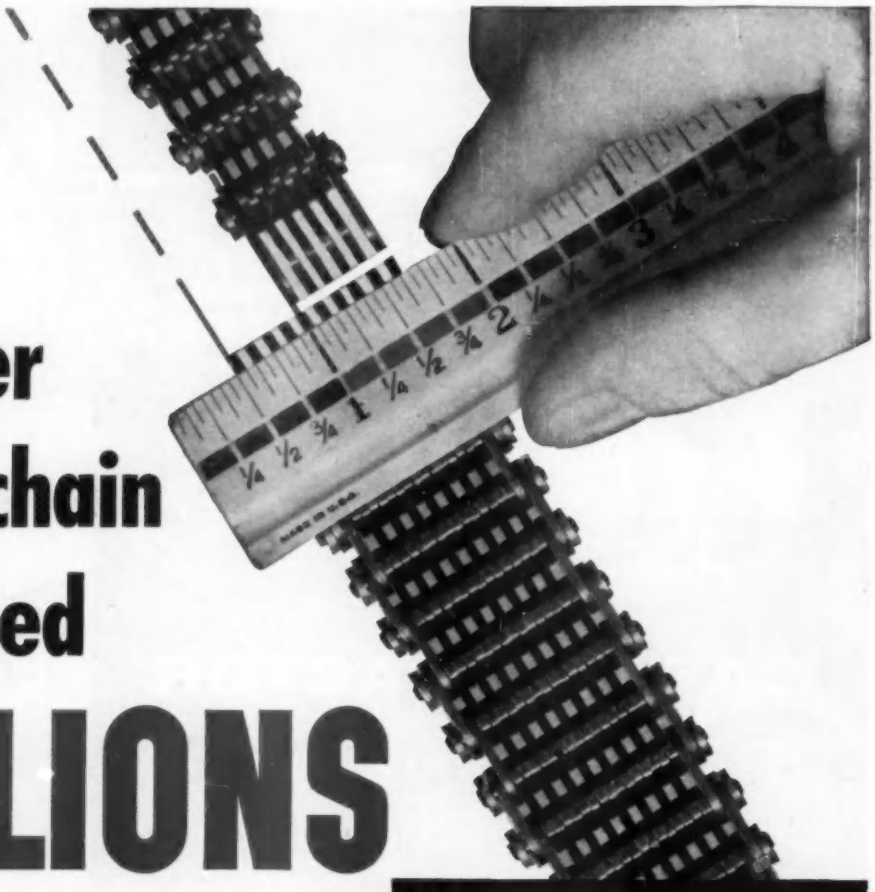
Victor Mfg. & Gasket Co., P. O. Box 1333, Chicago 90, Ill.
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Sealing Products *Exclusively*

OIL SEALS • GASKETS • PACKINGS • MECHANICAL SEALS

Right, ½-in. pitch, 11/16-in. wide timing chain



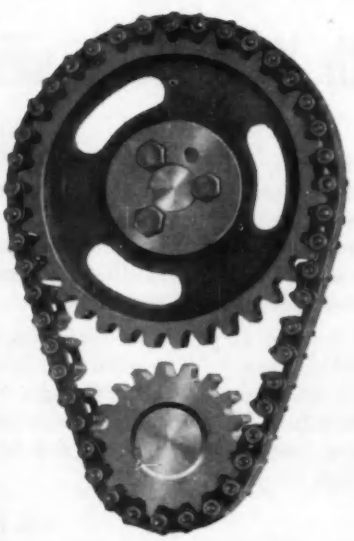
This narrower timing chain has saved MILLIONS of dollars for leading car makers

It's one of the reasons why so many automotive designers are turning to LINK-BELT 1/2-inch pitch timing chain

SAVING even a fraction of an inch of car length can mean a substantial reduction in production costs. And by permitting use of narrower sprockets, shorter camshafts, crankshafts—and cutting overall length, where desired—Link-Belt 11/16-inch width timing chain has brought significant economies to many car manufacturers.

Originated by Link-Belt in 1949, this narrower, ½" pitch design has been adopted by more and more leading auto makers. And the fact that it has accommodated a better-than-100% horsepower increase on some engines testifies to its exceptional durability.

For more complete information, write for Book 2065.



GREATER CAPACITY IN PIN BEARING AREA of Link-Belt's ½-in. pitch chain permits use of a shorter width than conventional ⅜-in. pitch designs.

LINK-BELT

TIMING CHAINS AND SPROCKETS

LINK-BELT COMPANY: 220 South Belmont Ave., Indianapolis 6, Ind.

14,709



New International
"A-Line" Truck

ANOTHER NEW INTERNATIONAL ...STEERED BY ROSS

Ross STEERING

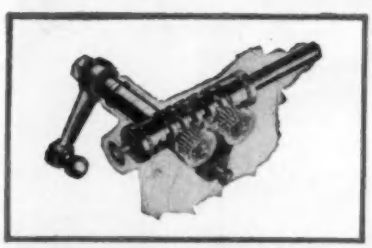
● **They're new** and they're news . . . these distinguished new International "A-line" trucks.

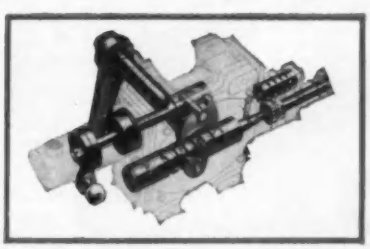
And they're a happy combination of fresh, clean "Action-Styling" and handling ease, plus famed International truck performance and dependability.

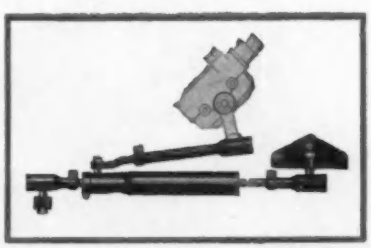
Among many outstanding features for "relax as you work" operation, is easy, safe, economical Ross Steering.

Ross invites discussion of any steering problem—manual or power.

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Gemmer Division • Detroit







CAM & LEVER MANUAL . . . HYDRAPOWER INTEGRAL . . . HYDRAPOWER LINKAGE

CAKE MIX IN A "JIFFY" WITH

CYPAK

Controlling automatic storage conveyors at Chelsea's modern food plant

Chelsea Milling Company, maker of well-known "Jiffy" brand premixed foods, uses flexible CYPAK* static control to reduce material handling costs in their plant at Chelsea, Michigan.

CYPAK begins at the mixing and packaging machines, memorizing the sequence of cartons going to the warehouse. Cartons are identified automatically, and then CYPAK directs storage according to the preselected pattern.

Subsequent delivery of cartons from storage to dock is also completely predetermined, making the warehousing operation totally automatic. An additional benefit realized by Chelsea with this system has been great reduction in carton breakage.

For complete information on CYPAK, call your Westinghouse representative, or write Westinghouse Electric Corporation, P.O. Box 868, 3 Gateway Center, Pittsburgh 30, Pennsylvania.

*Trade Mark

J-22033

YOU CAN BE SURE...IF IT'S

Westinghouse





Mr. Lester L. Bosch, Partner, Bosch & La Tour views their system design.

(Advertisement)

R B&W FASTENER BRIEFS

RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY



Technical-ities

By John S. Davey

Factor of Safety— make it a reality

You can't calculate that with a bolt having yield strength of 4 times the working load you're automatically getting a *safety factor* of 4. Far from it. Only when the bolt is *tightened* to four times working load do you get it.

That's because rigidly fastened members can be externally loaded to the full value of residual tension in bolts without any separation or extra bolt stress.

Suppose you need a bolt for a 5000 lb. working load. For a X4 safety factor, you use a bolt of 20,000 lb. capacity, and tighten it to 20,000 lb. tension. If you tighten to only 10,000 lbs., any external load larger than this causes loosening, and progressive bolt failure from fatigue. So your safety factor is really only 2.

PRODUCTION MAN FOLLOW-THROUGH IMPORTANT

Factor of safety, then, is not established on the drawing board. It can only be put into the product by the shop man with wrench. In short, a bolt is no better than the supervision of its tightening.

A NOTE ON FLEXIBLE JOINTS

This case is different. You tighten such a joint just to working load. So use a bolt capable of this *plus* any added stress *multiplied* by your safety factor.

How to simplify bolt and nut usage

DESPITE their now unified dimensions, "standard" fasteners number thousands upon thousands of different types and sizes. More and more companies are beginning to realize that *usage* simplification offers advantages.

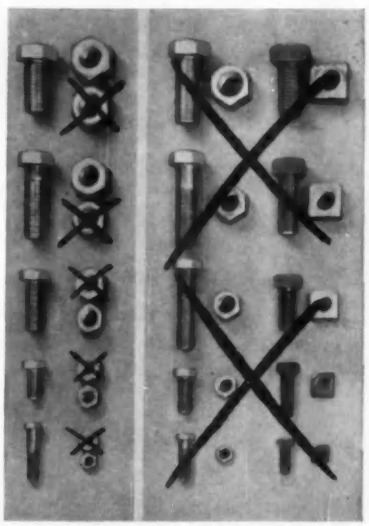
EXAMPLES

A well known electrical manufacturing company finds it no handicap to eliminate all 1/16" bolt sizes above 3/8", thereby simplifying production and purchasing.

One engineering firm eliminated 1700 different fastener items from inventory by determining that the jobs could be done as well by other sizes or types.

SOME SUGGESTIONS

To guide your thinking, RB&W points up the following ways to simplify: (1) Forget thread fits for all but specialized needs – standard "tolerance fits" have thoroughly proved themselves. (2) Why adhere to double thread standard when coarse threads prove stronger and assemble faster? (3) Stick with hex head bolts – they do better jobs than square. (4) It can save money to change diameter or length, rather than to add another item to stock. (5) Two standard physical grades meet most load range requirements – do you really need special alloys? (6) Heavy nuts really belong with larger size bolts – use finished nuts with the smaller sizes.



Here is a graphic display of possible simplification. From a typical array of fasteners, it shows what may be superfluous for meeting the requirements of proper fastening in a great many instances.

RB&W would be happy to enlarge on these facts, and help you simplify fastener selection to get proper joint strength and cut assembly time and inventory. Write Russell, Burdsall & Ward Bolt and Nut Company, Port Chester, N.Y.

Plants at: Port Chester, N. Y.; Coraopolis, Pa.; Rock Falls, Ill.; Los Angeles, Calif. Additional sales offices at: Ardmore (Phila.), Pa.; Pittsburgh; Detroit; Chicago; Dallas; San Francisco.

High strength bolts save costly crane



At one company's plant, a large, heavy-duty crane had deteriorated due to rivets loosening. Replacing with new rivets was no permanent answer, but RB&W high tensile bolts were.

Used with hardened washers, these RB&W bolts clamp members together so tightly, no slipping into bearing takes place, holes are reinforced against fatigue, and connections become vibration-proof.

Assembling heavy duty equipment with RB&W high strength bolts in the first place can avoid such problems and create more satisfaction with the product.

For whatever you fabricate . . .

N-A-X FINEGRAIN STEEL COMBINES STRENGTH WITH FORMABILITY



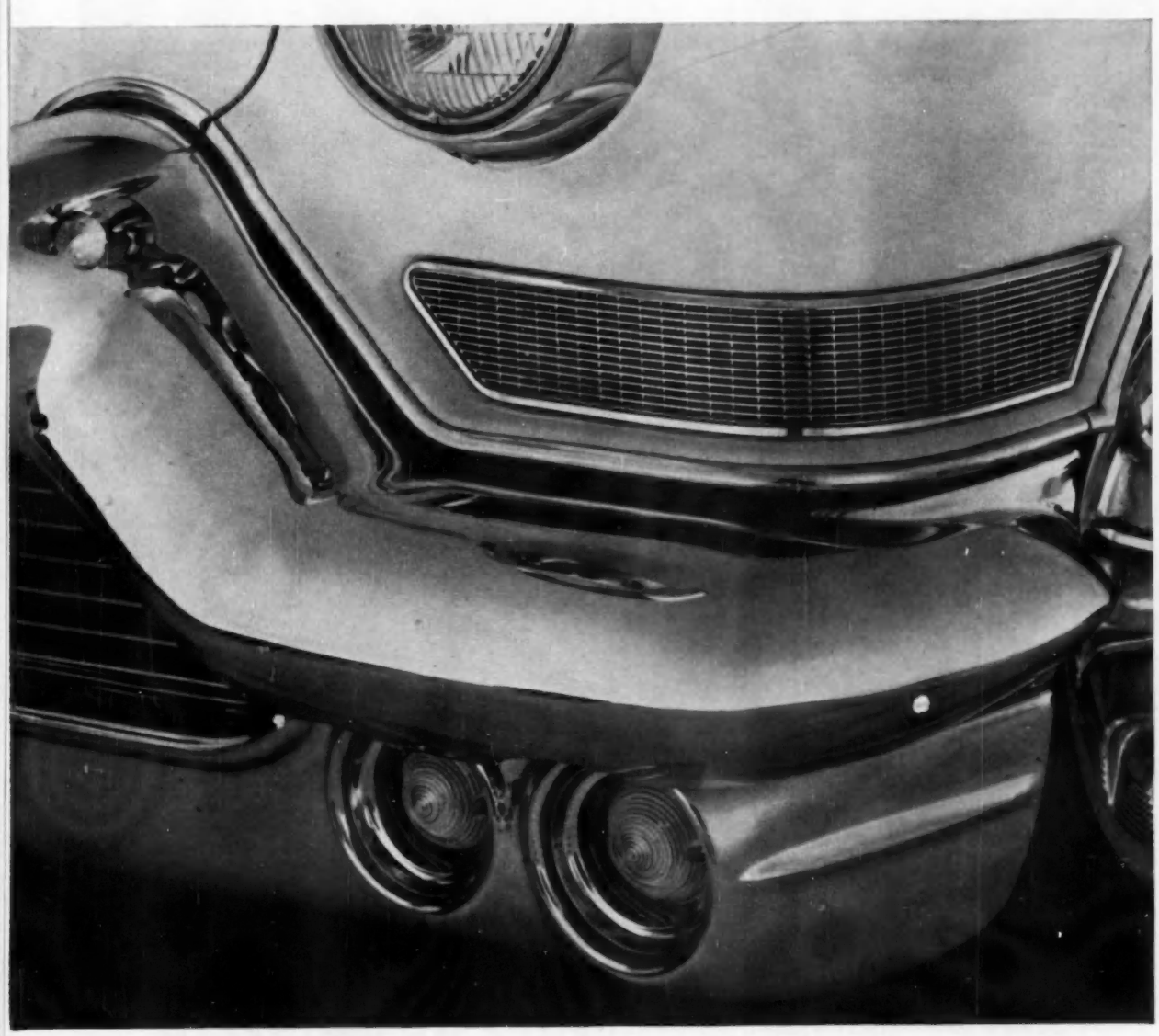
Among the many economical advantages of N-A-X FINEGRAIN—a low-alloy, high-strength steel with widely diversified applications in modern metals design—is its combination of great strength with excellent formability. Even at the higher strength levels (50% greater than mild carbon steel) N-A-X FINEGRAIN can be cold formed and drawn into difficult stampings and cold formed shapes.

Take these qualities and add the ability of N-A-X FINEGRAIN to be readily polished to a high luster at minimum cost, and when plated, you have a steel ideally suited for such applications as bumpers, bumper guards, and many others where strength and toughness with good finish is important.

Engineers and designers like N-A-X FINEGRAIN especially because its physical properties are inherent in the "as rolled" condition. No subsequent treatment is needed to insure its characteristics.

Check these other important advantages: N-A-X FINEGRAIN steel, compared with carbon steel, is 50% stronger • has high fatigue life with great toughness • is stable against aging • has greater resistance to wear and abrasion • is readily welded by any process • offers greater paint adhesion. NOTE: Where greater resistance to atmospheric corrosion is an important factor, our N-A-X HIGH-TENSILE steel is recommended.

For whatever you fabricate, from bumpers to bulldozers, with N-A-X HIGH-STRENGTH steels you can design longer life, or less weight, and economy into your products. Let us show you how.



One of many applications where N-A-X FINEGRAIN'S strength with formability saves production money.

N-A-X
HIGH-STRENGTH STEELS

N-A-X Alloy Division, Dept. J-4
GREAT LAKES STEEL CORPORATION
Detroit 29, Michigan • Division of
NATIONAL STEEL CORPORATION

N-A-X Alloy Div., Dept. J-4
Great Lakes Steel Corp., Detroit 29, Mich.

☐ Please send me technical data on N-A-X FINEGRAIN steel.
☐ Please have your representative contact me.

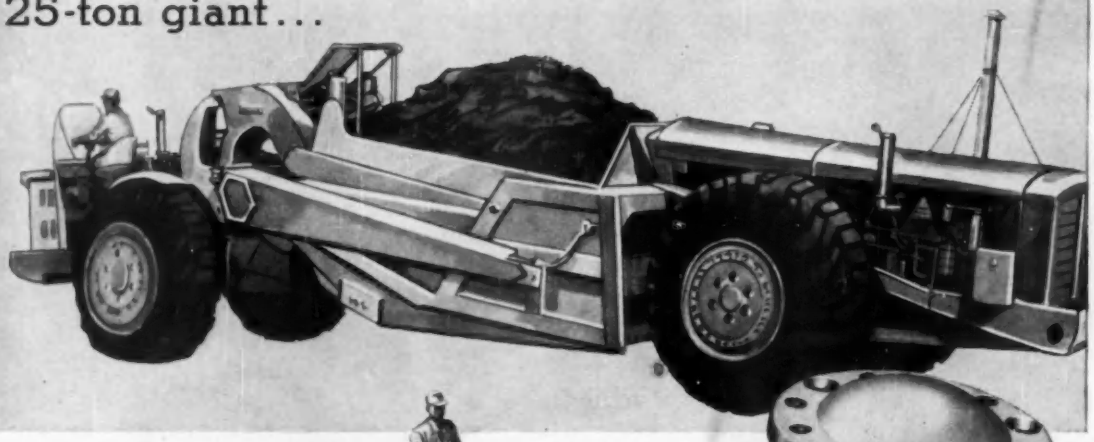
Name_____ Title_____

Company_____

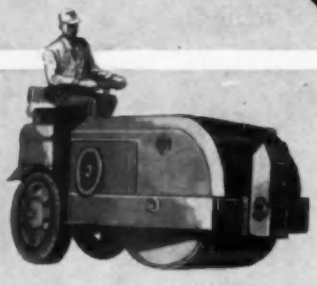
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25-ton giant...



...or 1½-ton roller



US AXLE SHAFTS

For any Road Construction Equipment

Whether you make a small roller . . . or a 25-ton road scraper, U.S. Axle can design and build axle shafts to your exact requirements. U.S. Axle is the manufacturer of the world's most complete line of replacement shafts for cars, trucks and buses. Every U.S. Axle Shaft is precision made from finest alloy steels to rigid specifications to assure a perfect fit. Every one is shot-peened for extra toughness and long-lasting, dependable performance. Every one is guaranteed to enhance your product's reputation for fine quality.

Send us your blueprints and specifications for prompt quotations on your requirements.

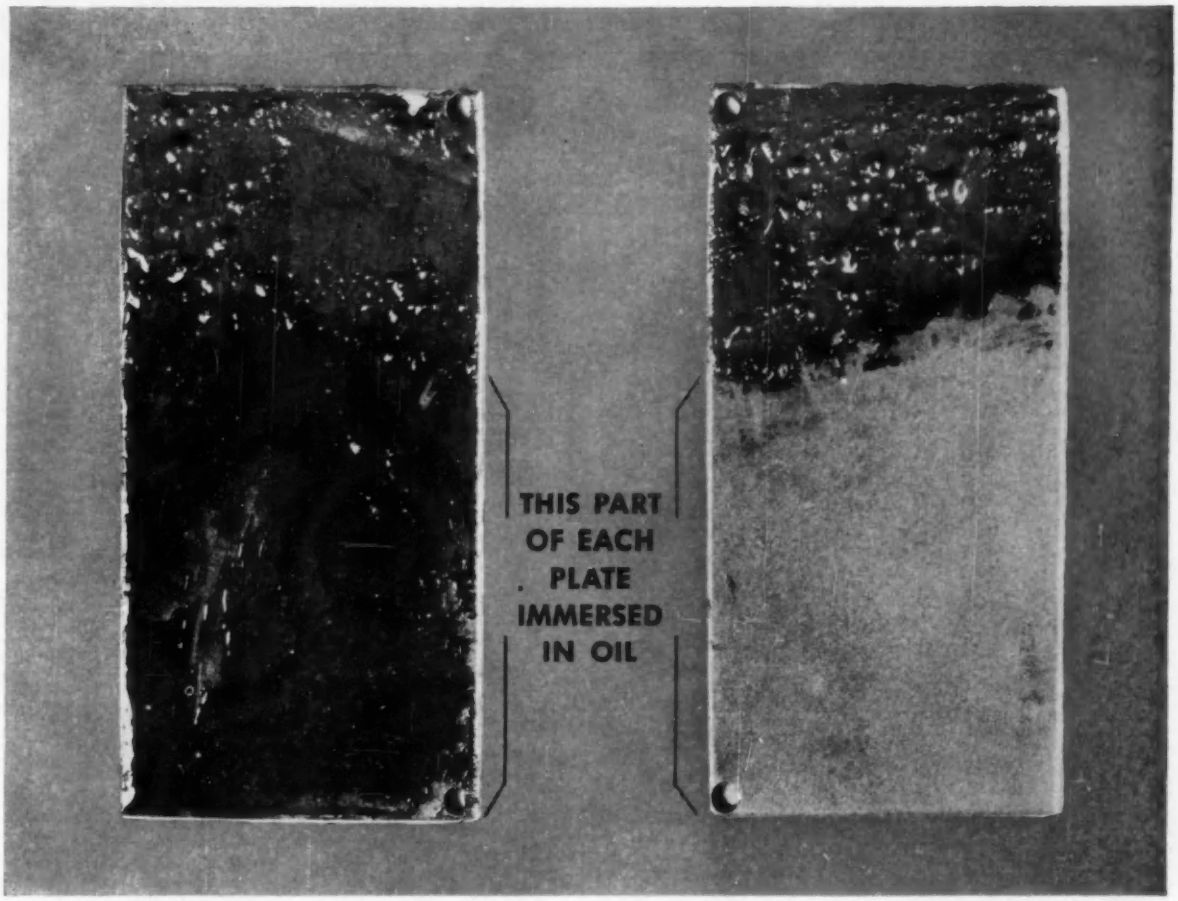


"THE WORLD TURNS ON U. S. AXLES"

THE US AXLE COMPANY, INC.

Since 1920 • POTTSTOWN, PENNSYLVANIA

US AXLES



This sludge-coated metal plate was partially immersed in a beaker containing a *regular hydraulic oil* heated to normal operating temperature. Though the oil was agitated throughout the test, nearly all the sludge remained on the plate.

This similarly sludge-coated plate was partly immersed in a SUNVIS 700 oil, also heated to normal operating temperature. During the same period, with the same degree of oil agitation, the immersed part of the plate was rinsed clean of sludge.

Simple test shows how

SUNVIS 700 OILS CLEAN HYDRAULIC SYSTEMS...WITHOUT SHUTDOWNS

Sunvis® 700 oils clean while they work. Their cleansing action removes deposits in systems contaminated by dust, sludge, varnish, and other foreign materials.

SUNVIS 700 oils carry these contaminants in suspension for easy removal. This eliminates costly teardowns. Systems stay clean. In addition to being ideal for hydraulic systems, SUNVIS 700 oils are also suited for circulating systems and gear boxes.

If you want exceptional cleaning ability, oxidation stability, rust prevention, film strength, you need SUNVIS 700 oils. Ask your Sun representative for full details, or write to SUN OIL COMPANY, Philadelphia 3, Pa., Dept. AA-6.

INDUSTRIAL PRODUCTS DEPARTMENT

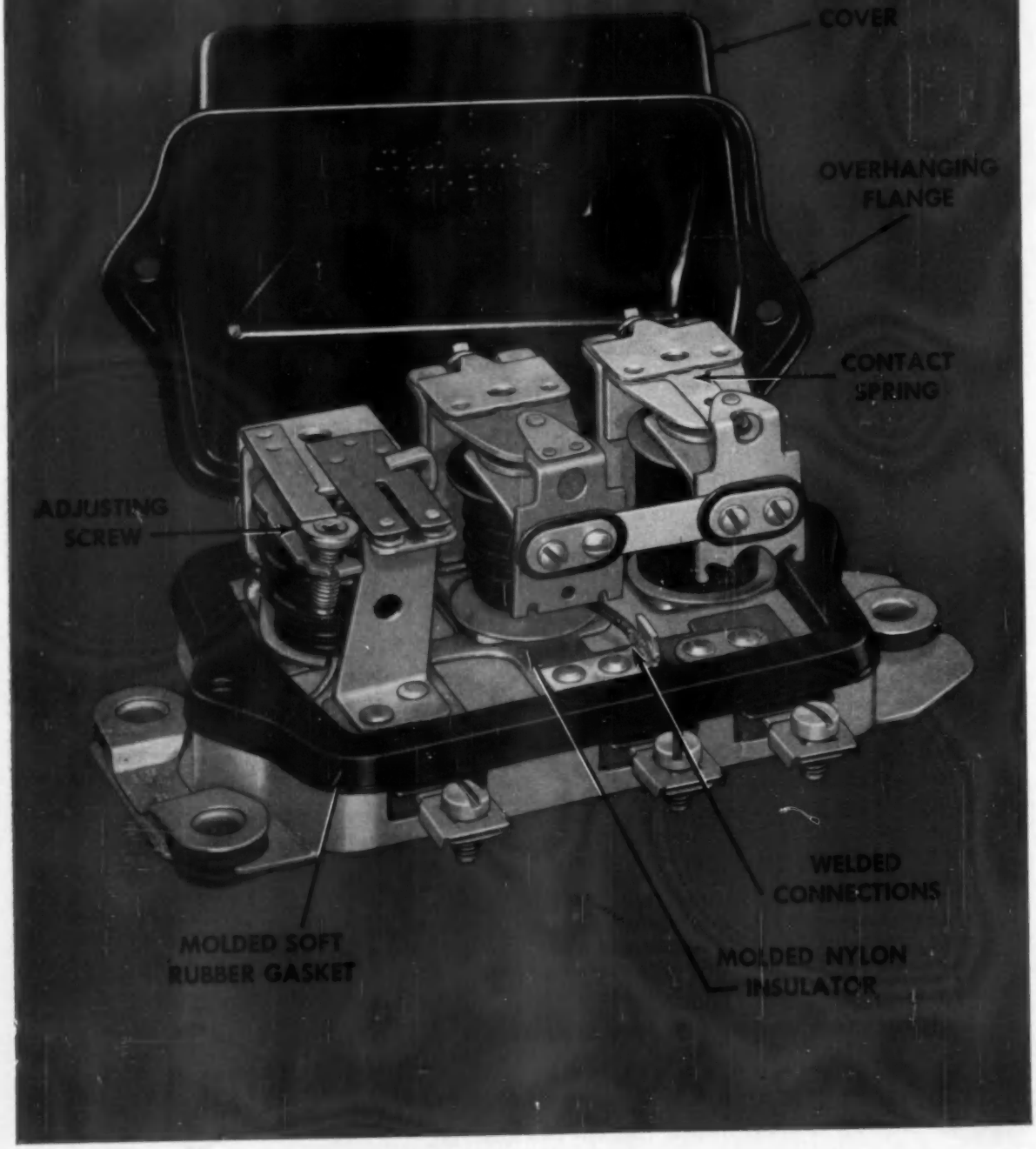
SUN OIL COMPANY Philadelphia 3, Pa.

IN CANADA: SUN OIL COMPANY LIMITED, TORONTO AND MONTREAL

SUNOCO®

©Sun Oil Co., 1957

PROGRESSIVE ENGINEERING MAKES THE DIFFERENCE



DELCO-REMY ANNOUNCES NEW WATERPROOF STANDARD REGULATORS WITH IMPROVED PERFORMANCE

Better electrical performance and greater dependability in any weather are important user benefits found in Delco-Remy's new waterproof standard generator regulators, now available for general replacement use.

And here are the features that make them the *right* regulators for millions of Delco-Remy equipped cars and trucks.

1. New overhanging one-piece formed-steel cover and mating base shed road splash . . . convenient attaching screws are *outside* the enclosed area. Molded soft rubber gasket seals out harmful oil and water vapors.
2. Integral sleeves of molded nylon insulator form permanent seal around rivets—assure watertight base.
3. New, longer, more flexible armature contact spring on voltage regulator unit assures more positive closing of contact points for smoother operation.
4. Welded electrical connections, and highest quality tungsten and non-tarnishing precious metal contact points, assure minimum resistance, maximum durability.
5. Special fine thread screw-type controls allow easy, highly accurate adjustment of all three units.

Always replace with Delco-Remy waterproof regulators when you service Delco-Remy equipped cars and trucks. These improved regulators are available from your car or truck dealer or the United Motors System.

DELCO-REMY • DIVISION OF GENERAL MOTORS • ANDERSON, INDIANA

GM GENERAL MOTORS

GENERAL MOTORS LEADS THE WAY—STARTING WITH

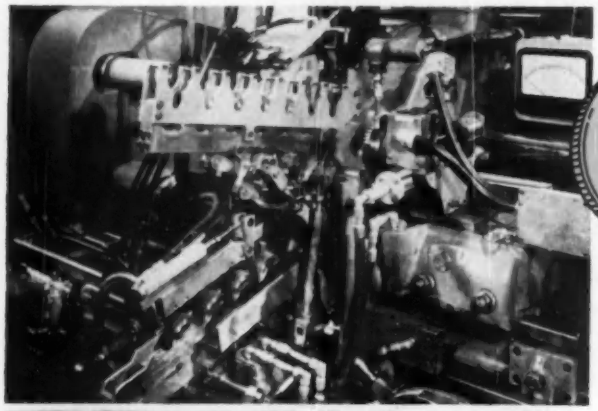
Delco-Remy

ELECTRICAL SYSTEMS

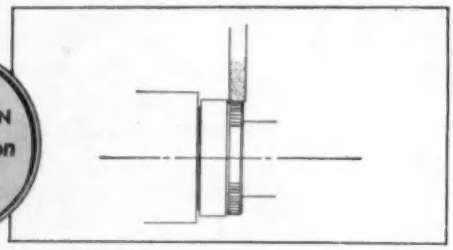
The more you grind the more you save with Norton...

cost-cutting automatic operations

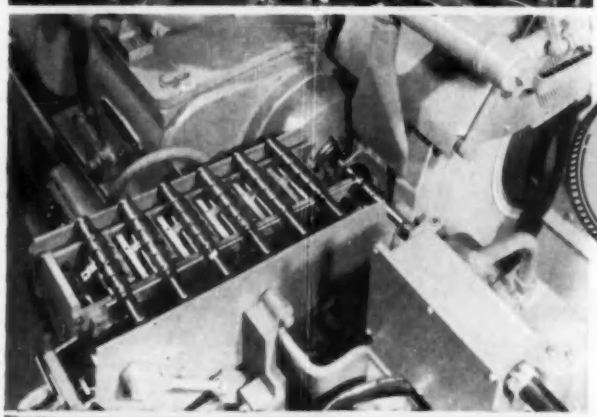
Typical automatic features on Norton grinders



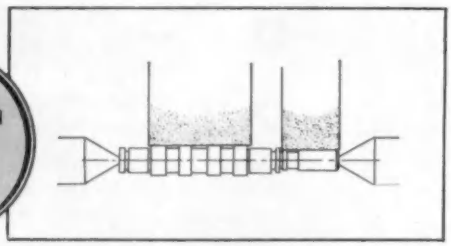
SAVINGS ON *Transmission Gears*



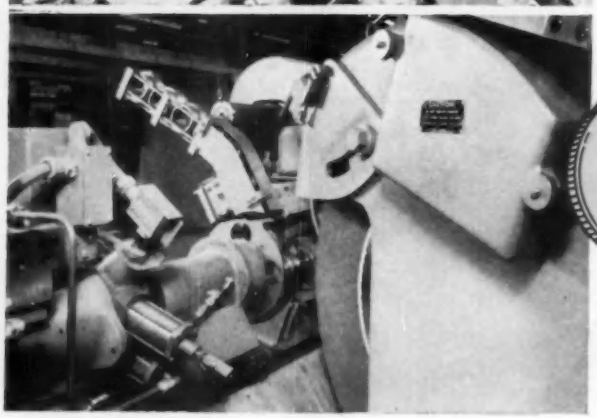
In a Type CTU Cylindrical Grinder arranged for completely automatic loading, grinding, and unloading of transmission gears, the part is held on a chuck and grinding cycle is terminated by an automatic air-electric grinding gage that signals when work is to size.



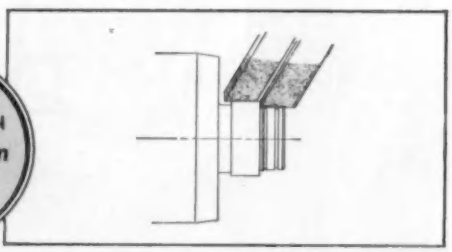
SAVINGS ON *Valve Pistons*



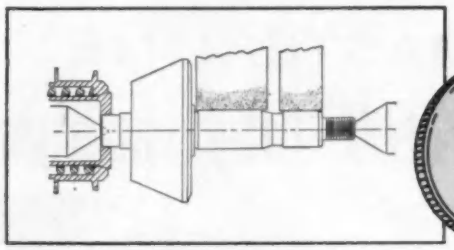
When a Type CTU Grinder is arranged for fully automatic loading and grinding of valve pistons the part is held on centers and driven by a floating type collet. Work is ground by a double-wheel mount.



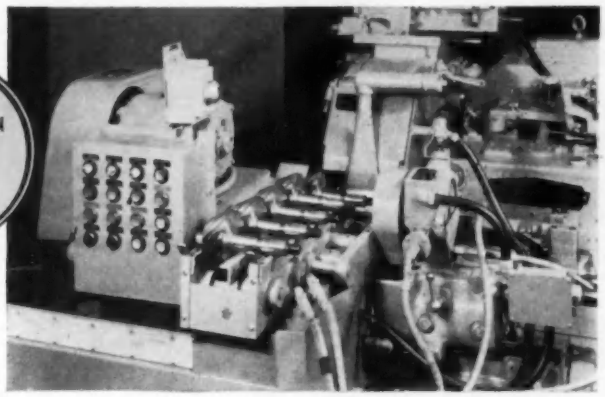
SAVINGS ON *Transmission Sleeves*



On this Type CV-4 Angular Wheelslide Grinder chucked grinding of transmission sleeves is arranged in a completely automatic cycle. Longitudinal movement of a revolving turret loads the machine. A stripper type plate removes the piece when turret retracts as the grind is terminated by electrically timed control.



SAVINGS ON *Stem Pinions*



The Stem Pinion Grinder reduces time and effort with a completely automatic cycle, electrically timed arrangement for grinding these hard-to-handle parts. Progressive escapements in the automatic loading mechanism release the parts in succession, avoiding gear mesh.

NEW ECONOMY!

Norton No. 2 Unitized Transfer Grinder Grinds Crankpins Automatically

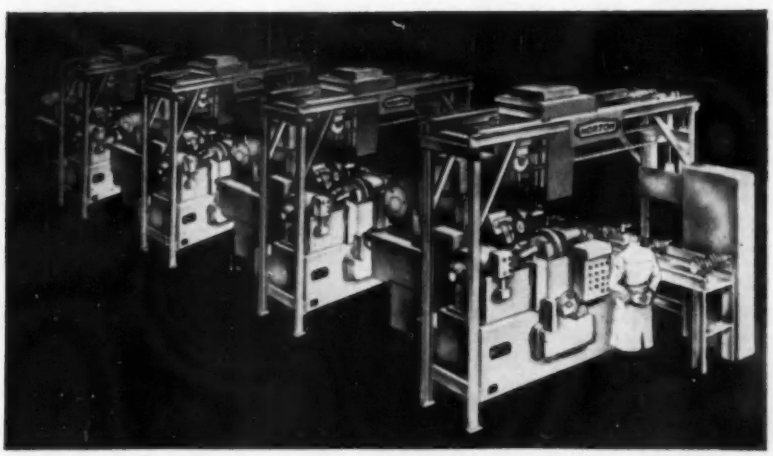
Here's a newly developed machine that automatically grinds crankpins faster and for less money than ever before possible. Advanced features like the following are reasons why:

Unitized Operation. Each grinding station, operating independently, can be automatically by-passed without affecting continuous production.

New Transfer Mechanism. Double set of hooks speeds loading, unloading and transferring of crankshafts from one grinding unit to another.

Fast Production. Cycling grinds 240 crankpins on 60 V-8 crankshafts per hour, due to many automatic operations.

Only One Operator Needed. Others are freed for different jobs. And the machine reduces floor-space requirements.



Norton has developed a wide range of fast, automatic grinders. You can get them in conventional and angular wheelslide types — also in special types for grinding automotive valve faces and crankshaft pins.

Remember: only Norton offers you such long experience in both grinding machines and wheels to bring you the "Touch of Gold" that helps you produce more at lower cost.

For further information about these machines — including how the No. 2 Unitized Transfer Crankpin Grinder can save you many dollars daily — contact your Norton Representative. Or write to NORTON COMPANY, Machine Division, Worcester 6, Mass.

District Offices:
Worcester • Hartford • Cleveland • Chicago • Detroit

To Economize, Modernize with NEW

NORTON

GRINDERS and LAPPERS

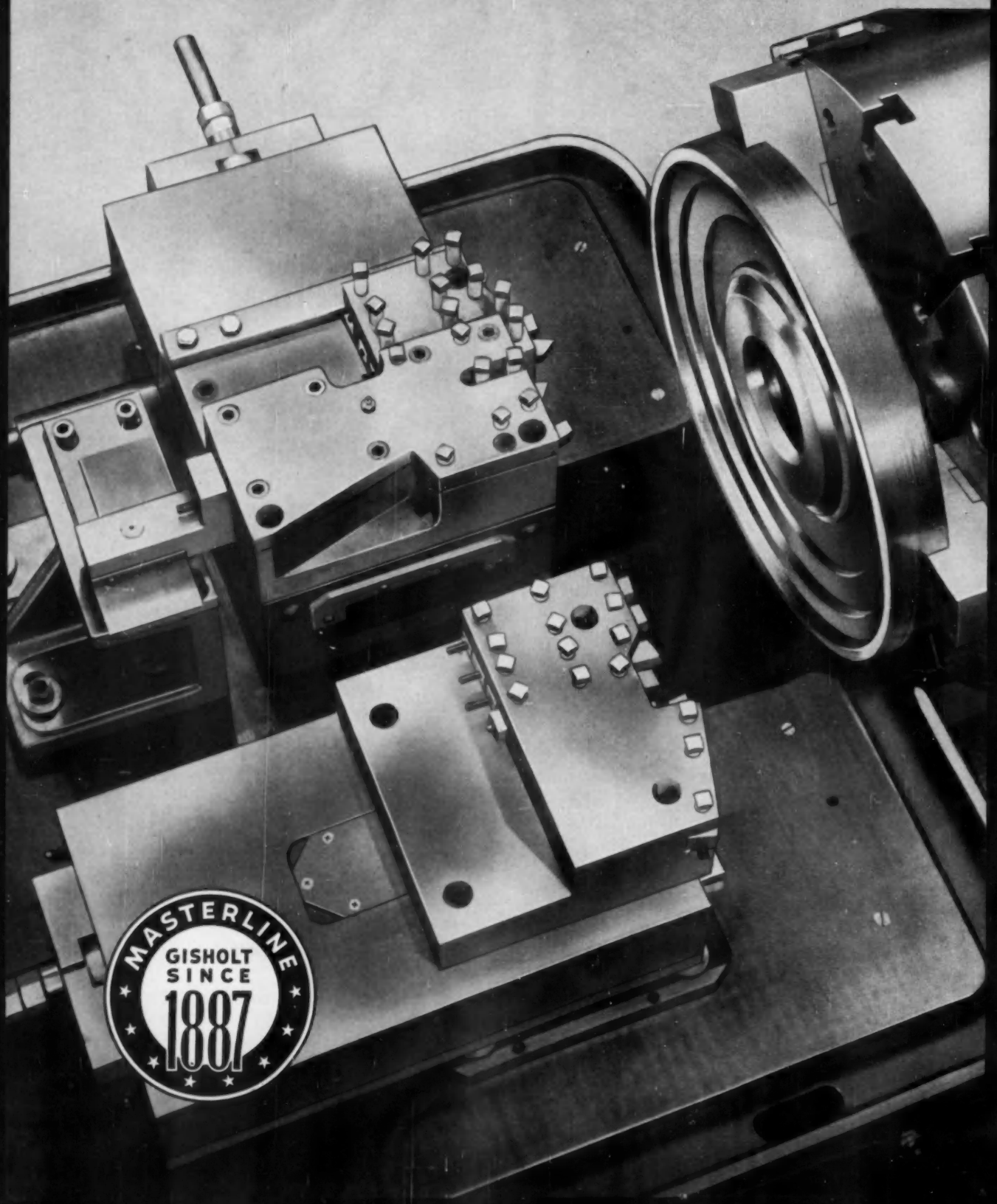
Making better products... to make your products better

NORTON PRODUCTS:
Abrasives • Grinding Wheels • Grinding Machines • Refractories

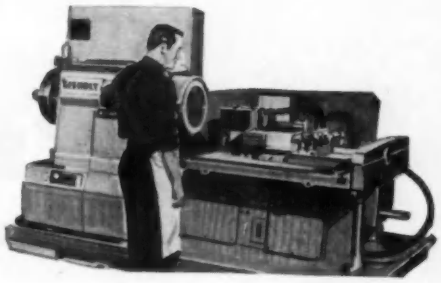
BEHR-MANNING DIVISION:
Coated Abrasives • Sharpening Stones • Behr-cut Tapes

This New GISHOLT MASTERLINE

SIMPLIMATIC AUTOMATIC LATHE may save you



the cost of a special machine



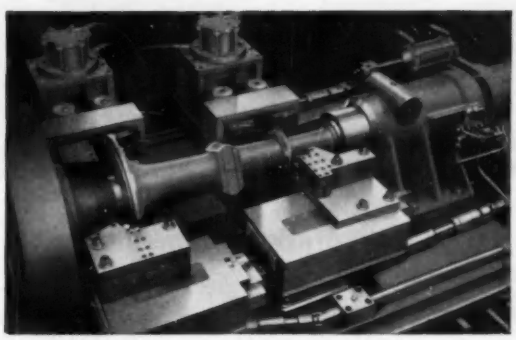
HERE'S WHY: the machine itself—headstock, bed, extra wide platen table—is *standard!*

Yet with the new Gisholt MASTERLINE Simplimatic Automatic Lathe, you have ample space for an *infinite* number of slide and tool arrangements. You can use front, center, rear and auxiliary slides—all moving at different feed rates—carrying enough tools to machine a maximum number of surfaces in a single chucking. All slides are easily mounted at correct angle to the work—keeping tool overhang to absolute minimum for increased rigidity and increased accuracy. And with the Simplimatic's table feed, tools can engage with the work or perform additional machining operations before actual slide movements begin.

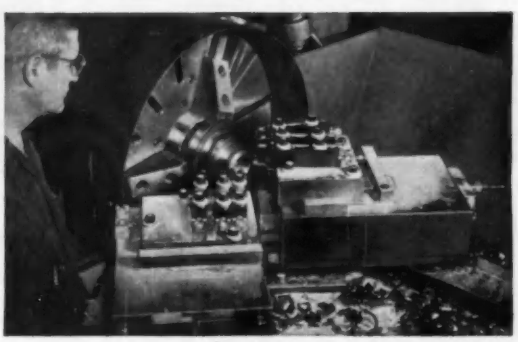
Because the Gisholt Simplimatic is a standard machine, it is *easy* to set up, operate and maintain. In many cases, the automatic cycle frees the operator to handle additional units or perform other work. And the basic design is readily adapted for work-handling devices, which even further simplify the operator's job and speed production!

Ask your Gisholt Representative to show you how efficiently the Simplimatic can handle your problem parts—using a simple, standard machine transformed by addition of standard tool slides, tool blocks and chucking equipment—performing *special* machine functions at *standard* machine prices! Call him today for full information on the Simplimatic!

Simplimatic setup for machining both ends of tractor rear axle housings in one chucking. Four tool slides are used, two at the front and two at the rear of the platen table. Machining includes turning and chamfering, forming and straddle-facing, with tool relief provided for facing tools on the rear tool blocks.



Six different sizes of tough steel oil well cutter bits are handled with ease and efficiency by this tooling setup. All slides and tools are placed at correct angle to the work. Tools are mounted on riser plates, permitting pre-setting for quick change-over and adjustment. Rigid support eliminates chatter on heavy forming cuts.



READY NOW! Write today for new Catalog 1159-A on Gisholt MASTERLINE Simplimatic Automatic Lathe. Fully illustrated—shows 31 typical jobs.



GISHOLT

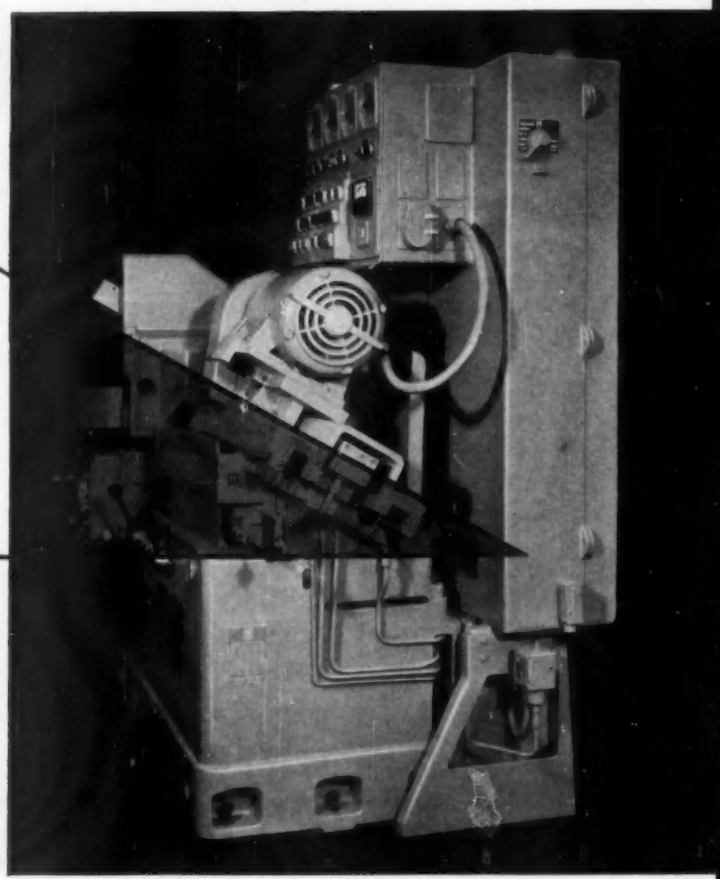
GISHOLT MACHINE COMPANY

Madison 10, Wisconsin, U.S.A.

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • PACKAGING MACHINES • MOLDED FIBERGLAS PLASTICS

New RITE-ANGLE CENTRI-MATIC

cuts grinding time as much as 50%



A NEW ANGLE in internal grinding gives greater strength and rigidity for faster stock removal, with highest accuracy and precision

The Heald RITE-ANGLE Centri-Matic represents the latest and most advanced design in the field of high-precision internal grinding. It includes all the basic advantages of other Heald internals — plus the added feature of substantially increased production rates. Mounting the wheelhead table at a 30° angle provides greater strength and stability and permits much faster stock removal.

Production economies due to faster grinding cycles are improved in all sizes of work handled on this equipment, but are most apparent in the larger (up to 4½" O. D.) sizes, where grinding time can be reduced as much as 50%.

This new RITE-ANGLE design is now available in the Model 190A Centri-Matic for straight and taper bores, and the Model 1901A Centri-Matic ball track grinder — both machines providing a new high in production, with maximum accuracy and precision, for work up to 4½" O. D. Ask your Heald representative for complete information or send for a copy of new RITE-ANGLE Bulletin.

OTHER ADVANTAGES

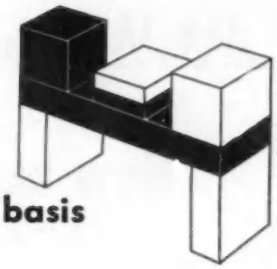
- Choice of Hi-Frequency or Belt-Driven Wheelheads
- Vee-Way Accuracy of Alignment with hardened and ground box-type table ways
- More Efficient Swarf and Coolant Disposal
- Infinitely Variable Hydraulic Cycles
- Automatic Feed Control with Self-Adjusting Diamond

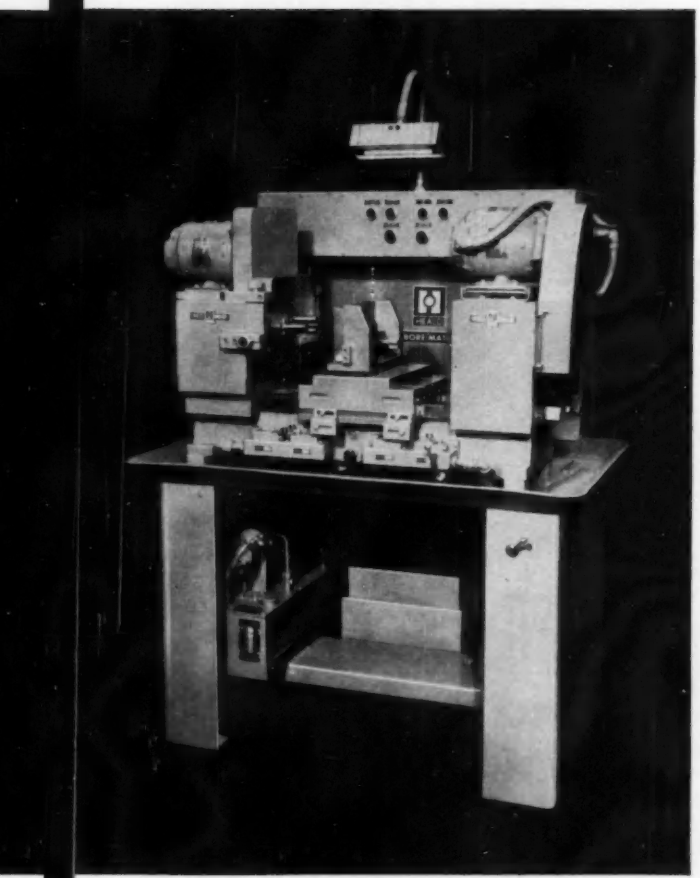
IT PAYS TO COME TO HEALD!

HEALD

New UNIT-TYPE BORE-MATIC puts

custom-built machine design on an "off-the-shelf" basis





. . . offers complete flexibility for meeting virtually all small-work Borizing requirements from a STANDARD LINE

Here, for the first time, is a small, compact Bore-Matic that gives you complete flexibility of design. Its unique "building block" arrangement, with standard interchangeable head units and accessories, provide's practically unlimited versatility for meeting all of your small-work Borizing requirements with minimum machine investment.

Basically, the Model O Bore-Matic consists of a precision-built table way unit with hardened and ground box-type ways, hydraulically operated table, hydraulic power unit and all necessary controls. A variety of boringhead units, complete with motor drive, can be interchangeably mounted on the table ways at either or both ends of the machine with precise alignment.

This Model O unit is built to the same standards of accuracy and precision as any other Heald Bore-Matic. It will easily hold tolerances of .0002 on regular production work and is capable of the same type of Borizing operations as a larger Bore-Matic. Ask your Heald representative for complete information, or send for a copy of new Model O Bulletin.

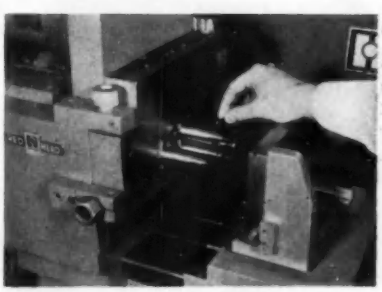
THESE STANDARD UNITS CAN BE USED IN ANY DESIRED COMBINATION

- Boringhead and Drive Unit for one or two standard Red Heads
- Multi-Spindle Boringhead and Drive Unit
- Swivel Boringhead and Drive Unit for one standard Red Head
- Hydraulic Cross Feed Units for standard or miniature heads
- Hydraulic or Manual Cross Slide
- Coolant Pump and Tank Unit
- Vertical Indexing Work Slide

NEW MULTI-SPINDLE BORINGHEAD

permits simultaneous multiple-hole Borizing on close centers

A Multi-Spindle boringhead assembly consists of any practical number and arrangement of miniature precision Red Heads, mounted in interchangeable spindle plates that are jig bored to the exact requirements of each job. Heads can be spaced as close as ¾" on centers and all holes are Borized simultaneously.



THE HEALD MACHINE COMPANY

Subsidiary of The Cincinnati Milling Machine Co.

Worcester 6, Massachusetts

Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York

M & M develops another specialized machine

New automatic inline transfer machine

handles 650 pistons per hour at 100% efficiency

Pistons are delivered to the first station of machine by a conveyor. They are picked off this conveyor, loaded into the machine, processed and delivered to another conveyor . . . all automatically. Here is the sequence of operations performed:

Station 1—Accept and unload piston from conveyor chute.

Station 2—Orient piston in relation to pin bores and bosses, using an electric eye and orientating table.

Station 3—Push piston down against positive locator by means of hydraulic expanding lug. Drill center of dome end and spot face two sections from the bottom upwards.

Station 4—Mill weight pads.

Station 5—Spot drill drive holes in weight pads.

Station 6—Drill drive holes in weight pads.

Station 7—Ream drive holes in weight pads.

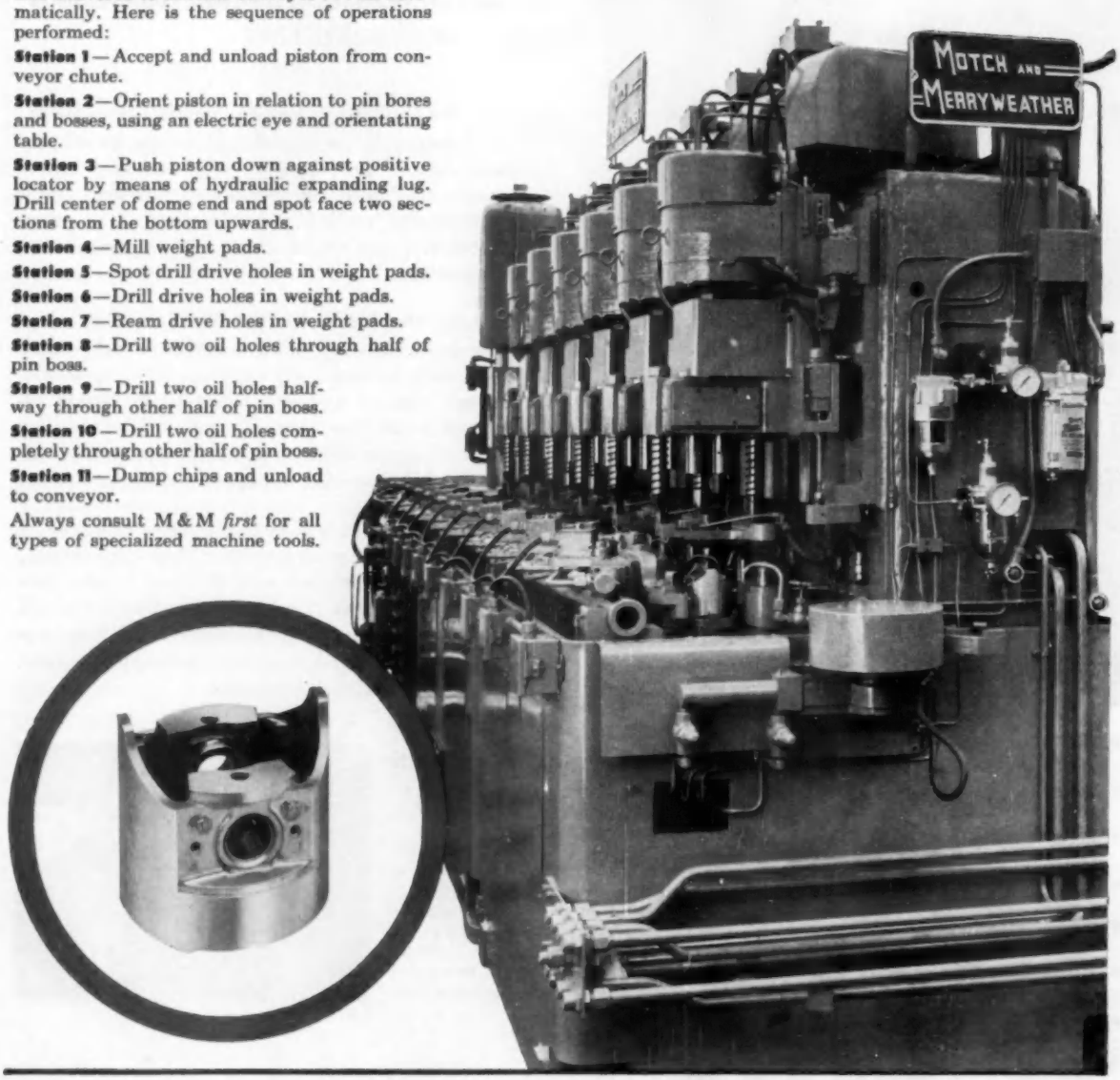
Station 8—Drill two oil holes through half of pin boss.

Station 9—Drill two oil holes halfway through other half of pin boss.

Station 10—Drill two oil holes completely through other half of pin boss.

Station 11—Dump chips and unload to conveyor.

Always consult M & M *first* for all types of specialized machine tools.



The **MOTCH & MERRYWEATHER MACHINERY** Company

MACHINE TOOL MFG. DIVISION
CLEVELAND, OHIO



Bulletin 145 gives you 16 fact-filled pages of photographs and data on standard and custom-designed worm gear speed reducers and wormgearing components for built-in drives.

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Photo Courtesy of General Motors Corp.



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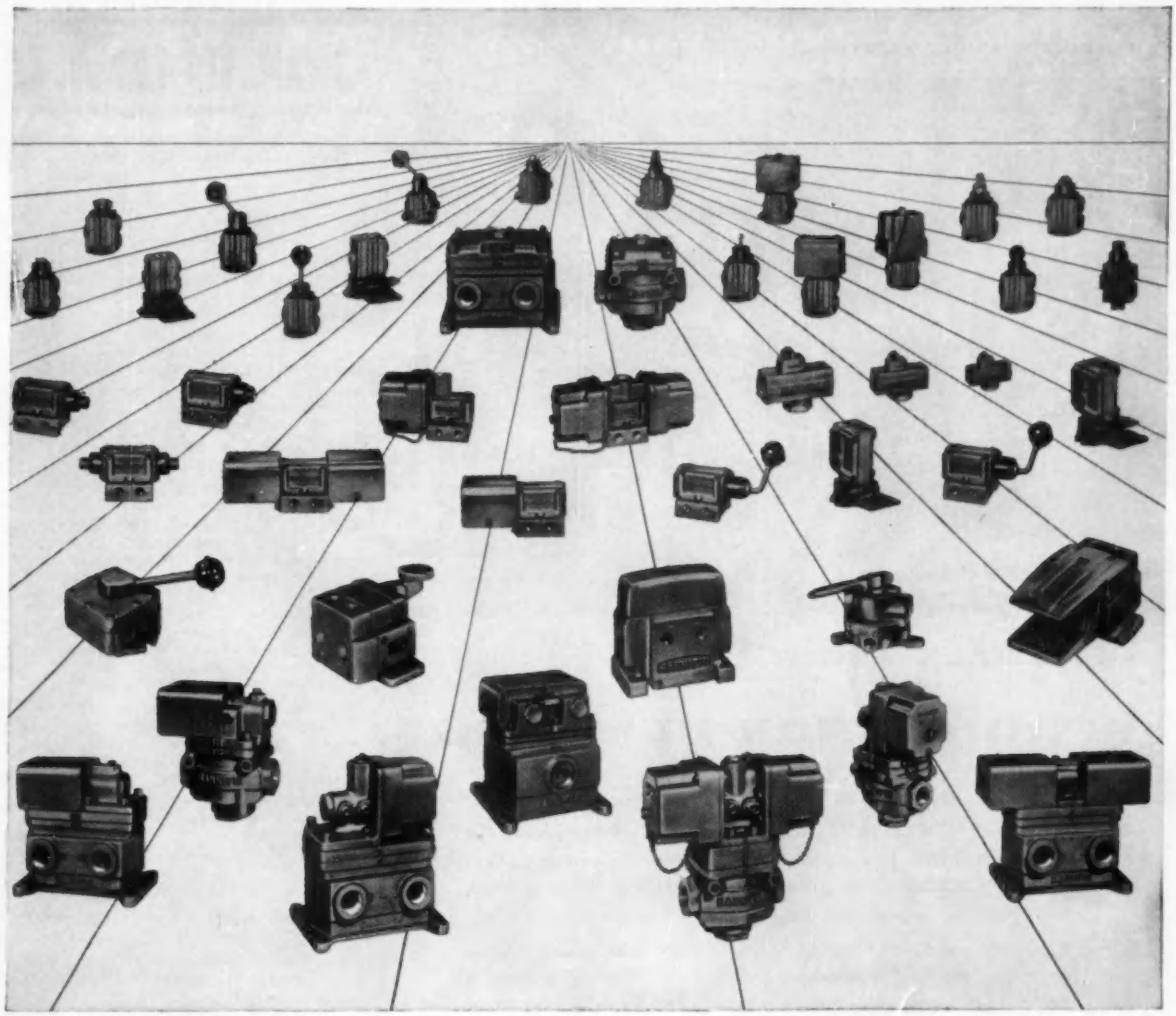
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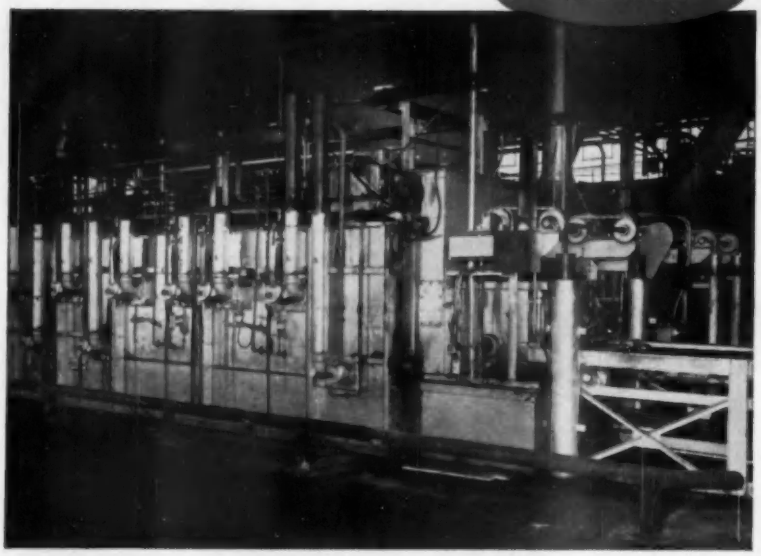
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CALENDAR

OF COMING SHOWS AND MEETINGS

International Congress of Combustion Engines, general meeting, Zurich, Switzerland .....June 15-25

American Society for Testing Materials, annual meeting, Atlantic City, N. J. .....June 16-21

Institute of the Aeronautical Sciences, national summer meeting, Biltmore Hotel, Los Angeles, Calif. .....June 17-20

American Society of Agricultural Engineers, annual meeting, Mich. State Univ., Mich....June 23-26

Chicagoland Fair, Navy Pier, Chicago, Ill. .....June 28-July 14

British Plastics Exposition, London, England .....July 10-20

National Machine Tool Builders' Association and American Tool Distributors' Association, annual sales conference, Cornell Univ., Ithaca, N. Y....July 20-Aug. 2

Eleventh Annual National Convention, Air Force Association and Airpower Panorama, Sheraton-Park and Shoreham Hotels, Washington, D. C.....July 31-Aug. 4

National Aviation Meeting, San Diego, Calif. .....Aug. 5-10

ASME Heat Transfer Conference, Penn State, University Park, Pa. .....Aug. 11-15

Bendix-Scintilla International Ignition Conference, annual meeting, Sidney, N. Y. .....Aug. 20-22

Western Electronic Show and Convention, Cow Palace, San Francisco, Calif. .....Aug. 20-23

Leipzig Fair, Germany .....Sept. 1-8

Farnborough Air Show, England.Sept. 2-8

Canadian International Air Show, Toronto, Ont., Canada .....Sept. 6-7

American Institute of Electrical Engineers, Petroleum Industry Conference, Sheraton Hotel, Philadelphia, Pa. .....Sept. 9-11

Instrument Automation Conference and Exhibit, Auditorium, Cleveland, O. .....Sept. 9-13

National Petroleum Association, annual meeting, Traymore Hotel, Atlantic City, N. J. .....Sept. 11-13

ASME Petroleum Mechanical Engineering Conference, Mayo, Tulsa, Okla. .....Sept. 22-25

Standard Engineering Society, annual meeting, Hotel Commodore, New York, N. Y.....Sept. 23-25

ASME Fall Meeting, Statler Hotel, Hartford, Conn. .....Sept. 23-25

Material Handling Institute, Joint-Industry fall meetings, Greenbrier Hotel, White Sulphur Springs, W. Va. .....Sept. 30-Oct. 1

National Electronics Conference, Hotel Sherman, Chicago, Ill..Oct. 7-9

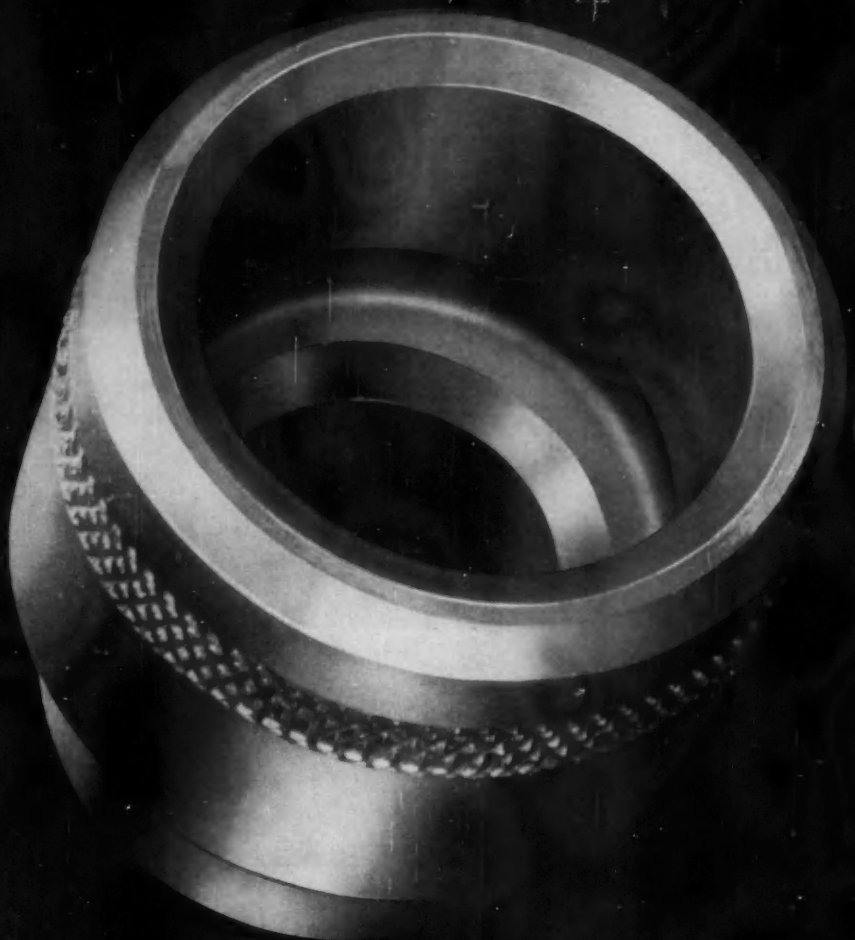
ASLE-ASME Lubrication Conference, Royal York Hotel, Toronto, Ont., Canada .....Oct. 7-9

American Institute of Electrical Engineers, fall general meeting, Morrison Hotel, Chicago, Ill..Oct. 7-11

ASME-AIME Fuels Conference, Chateau Frontenac, Quebec, Canada .....Oct. 10-12

Pressed Metal Institute, annual meeting, Castle Harbor, Bermuda .....Oct. 13-17

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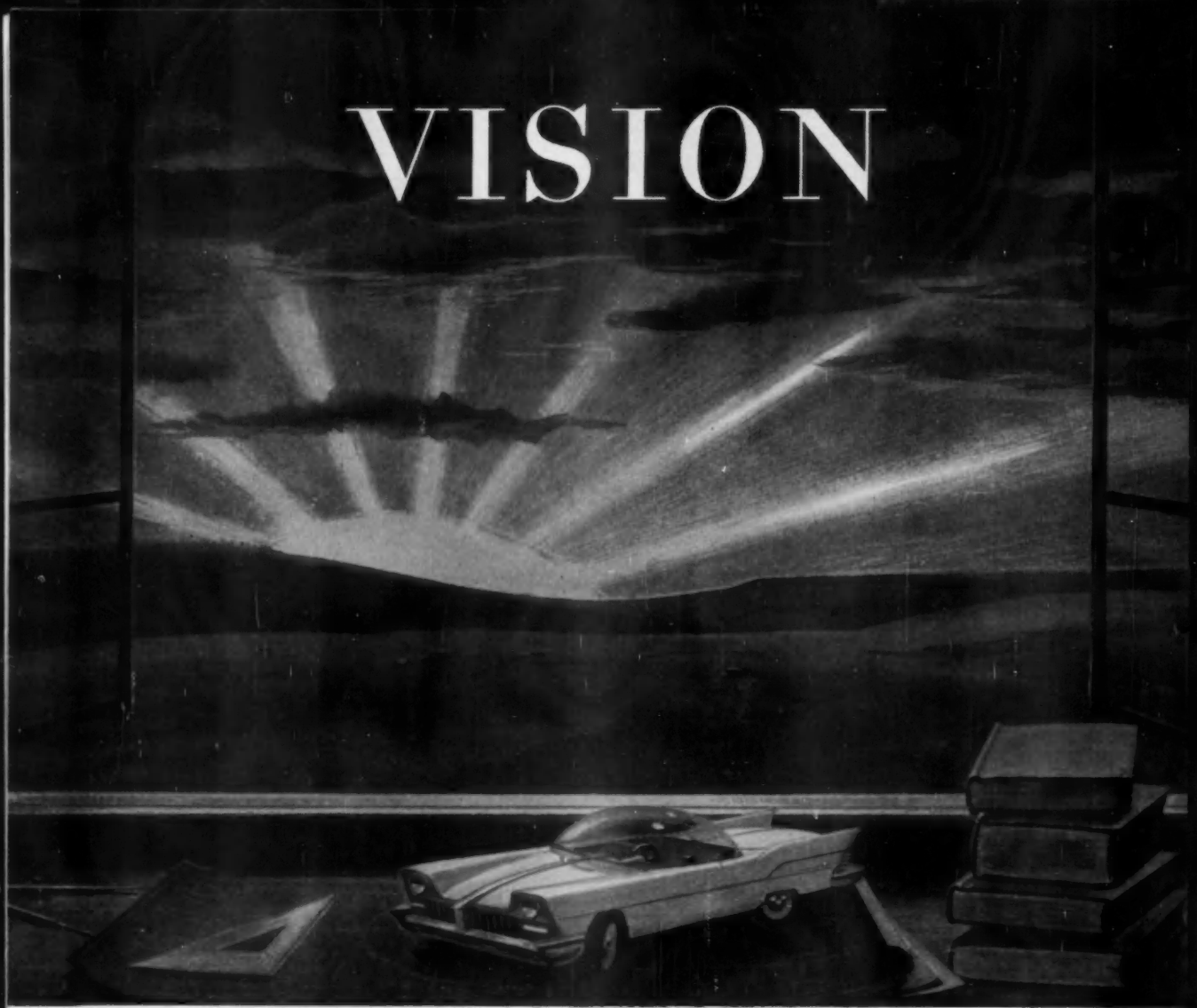
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High Spots of This Issue

New Production Techniques at Ford's Sterling Plant

Singular in physical size and capital investment, the Sterling Chassis Parts Plant of Ford Motor Co. also includes a wide array of new manufacturing techniques. The author takes the reader on an extensive guided tour of the operations. Page 48.

Still Faster Five Hundred

The true drama of the Indianapolis Race this year lies in the heart-warming victory of the "never-say-die" winner Sam Hanks, veteran of 12 previous starts. His story and the technical aspects of the contest are brought to life here. Page 56.

New Equipment at the Ionia Manufacturing Co.

Due to the accelerated demand for station wagons this year, Ionia Mfg. Co. was hard put to expand its productive capacity. How it did so with the aid of a new plant and the installation of new equipment in its main facility is discussed. Page 64.

The Application and Results of Value Analysis

A science used for the discovery and removal of unnecessary cost from a product without affecting its basic qualities, value analysis can be a worthwhile tool in planning. Here are its techniques and their usage at General Electric Co. Page 63.

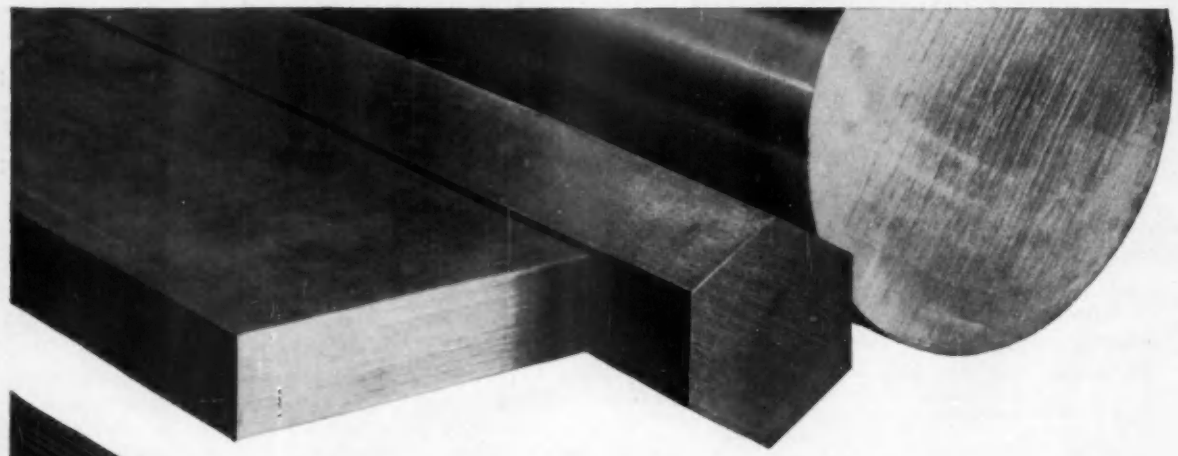
New Owosso Plant of Midland Steel Products Co.

Created to produce power brake and control equipment for cars, trucks, and buses, the Owosso Div. of Midland Steel Products Co. is housed in a new and modern plant. Many of its interesting features are described in this illustrated article. Page 70.

35 New Product Items And Other High Spots, Such As:

Molding water pump impellers; Dodge truck plant set-up; new Gulf automotive laboratory; Reynolds aluminum facility; small aircraft parts metal shop; Vickers conference; new air spring; Diesel inertia starter; ASQC convention; and industry statistics.

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News

OF THE AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 116, No. 12 **June 15, 1957**

GM Shareholders Approve Stock Option, Bonus Plans

The addition of a stock option plan and continuation of the company's bonus plan were approved by General Motors shareholders at their annual meeting in Wilmington, Del., last month (May). All 34 directors of the company were re-elected.

The incentive program was approved by the shareholders by a vote of more than 98 per cent of the shares voted. Recommendations for modifying the bonus plan and instituting a stock option plan were made by a special committee of six members of the boad of directors.

No member of the committee will be eligible under the program. Only some 250 corporation executives will qualify for the stock option plan (See AI, May 15, p. 38).

General Motors has had a bonus plan since 1918. Some 14,000 employes were granted bonus awards for 1956. The plan has been modified from time to time to meet changing conditions. The corporation's by-laws provide that the plan be submitted to shareholders for consideration at least once every five years. It was last submitted in 1952.

Chrysler Training Center Is Planned In Rye, N. Y.

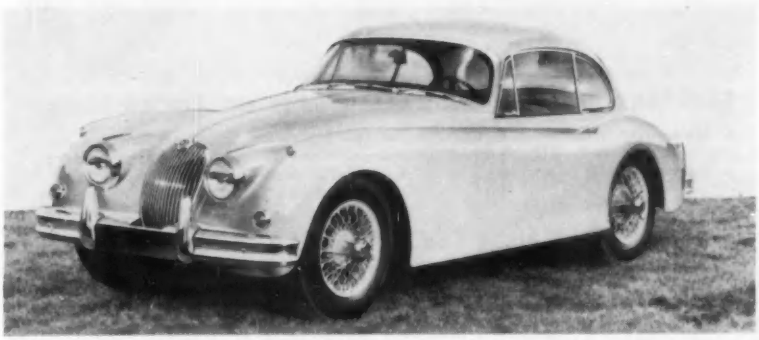
Chrysler Corp. has selected Rye, N. Y., as one of the sites where Chrysler Corp. will build a training center for dealer sales-service personnel. First of such training centers to be built outside of Michigan is now under construction in Atlanta, Ga. Other units also will go up in Chicago and Los Angeles.

The new training center building will be approximately 286 ft long and 157 ft wide. Ground floor plans call for a 375-seat auditorium, a cafeteria, sales classrooms, technical training rooms, and a building manager's office.

The auditorium will be a split level area which can be divided into two rooms by means of a folding partition. The training rooms and the auditorium stage will accommodate passenger cars and trucks.

Sales and service training activities at the four new centers will be directed by the company's main training center headquarters near Detroit. The center has trained some 6800 dealer sales personnel and approximately 3600 service personnel from throughout the U. S. since last June. Each of the new training centers will be able to train an estimated 4000 dealer sales personnel and 1600 dealer service personnel annually in full operation.

The technical training rooms will be equipped with hydraulic lifts, electrical testing equipment, wheel balancers, dynamometers, wheel alignment gauges and all other necessary equipment. Area, zone, and regional offices of the company's group marketing organization also will be housed in the new buildings.



JAGUAR SPORTSTER ROOMIER AND MORE POWERFUL

Jaguar XK 150 features servo-assisted Dunlop 12-in. disk brakes on all wheels. The six-cylinder engine of 210 cu in. displacement now develops 210 bhp at 5500 rpm; increased power is obtained by a new twin overhead camshaft cylinder head. Restyled hardtop and convertible bodies give greater interior room for passengers.

Uptrend In Solid Colors Is Noted By Oldsmobile

Changing trends in color styling and color preferences are noted by Oldsmobile. The company reports that approximately two-thirds of the orders for its 1957 models specify cars with solid colors. In 1955, only nine per cent of Oldsmobile orders specified a single color.

Increasing preference for bright colors and for medium tones also is noted in the 1957 model paint selection. White paint is most popular in constituting 19 per cent of current Oldsmobile paint usage. Green and black (including charcoal) are just about holding their own as popular colors; blue shades have slipped a little in overall preference.

Another significant trend in the 1957 color picture is the increasing popularity of high luster paints. Acrylic-based lacquer paints now make up more than 20 per cent of Oldsmobile's 1957 paint usage. This compares with slightly more than two per cent in the 1956 model run.

NEWS AUTOMOTIVE AND AVIATION



STUDEBAKER SCOTSMAN CALLED EASY ON POCKETBOOK

Depicted here is the two-door model in the new Studebaker Champion Scotsman line (see AI, June 1, p. 33). Powered by a six-cylinder, 101-hp engine, the car has a wheelbase of 116.5 in. and length of 202.4 in. This particular model is priced at $1776.

Ford and GM Chiefs See '57 Car Sales Near '56 Level

The automobile industry now is resigned to achieving its third best year instead of the second best, as had been hoped for earlier. Both Henry Ford II, president of Ford Motor Co., and Harlow H. Curtice, president of General Motors Corp., last month revised their forecasts sharply below levels predicted previously.

They now feel that 1957 car sales will about equal last year's 5.8 million units, perhaps a bit above that. The figure would be approximately 10 per cent under the 6.5 million cars anticipated last fall for 1957.

This marks the second straight year that car company officials have had to revise downward their original forecasts. Both were influenced by disappointing second quarter sales.

Twice now, the anticipated Spring boom in sales failed to materialize. The situation has given rise to the belief that perhaps a new pattern is being developed in automobile sales. It could be a pattern that will stabilize sales and production throughout the year and eliminate sharp "ups" and "downs" as experienced by the industry over the years.

"Whether the absence of a Spring upturn in sales for two successive years is a mere coincidence, or whether it is a sign of a new pattern in automotive sales, we do not know at this time," Mr. Ford observed last month at the company's second annual shareholders' meeting. The event was held at the new proving ground in Romeo, Mich.

"If a new pattern is developing, which would distribute sales more evenly throughout the year, it might alleviate some of our scheduling problems and bring a greater degree of employment stability to the industry," he said. "We are watching the development closely."

Approaching the second half of the year, the industry had built (through May 25) 2.79 million cars, slightly more than the 2.70 million in the like 1956 period. With approximately three million cars expected to be sold in the first half, the industry thus expects second half sales to total slightly under that, based on the new forecasts.

However, as in the past two years, the industry may be in for a surprise as the year draws to a close. It was in 1955, when nearly two million cars were turned out in the final quarter.

Despite the somewhat pessimistic views of total 1957 car sales, some companies can point to several accomplishments during the first six months. At Ford, dollar sales for the first half of the year are expected to hit a record six-month high of $3 billion.

Sales of Ford Motor Co. passenger cars in the first four months of this year surpassed those for the corresponding period last year by 14 per cent. This took place despite a three per cent decline for the automobile industry as a whole; truck sales also are ahead of last year.

Mr. Ford said he foresees no marked expansion of the economy for the remainder of 1957. "Production and employment for the economy as a whole now have leveled off at the peak we reached last December," he said.

"In the immediate future, total business activity in terms of constant dollars is likely to continue on the present high plateau. So far there are no strong forces in action to indicate either an expansion or a contraction of the economy over the next few months."

President Harlow H. Curtice of General Motors told GM shareholders at their annual meeting that "there is every indication that our economy is on a sound basis." Both total consumer spending and capital expenditures by business are now at all-time highs.

The economy seems "to be on a plateau, with gross national product running at a record annual rate of $427 billion." This compares with a gross national product of $412 billion last year. "It is generally expected that gross national product will remain fairly steady over the next few months, with a moderate rise anticipated for the fourth quarter."

Mr. Curtice went on to say that, as currently scheduled, GM's car and truck production in the U. S. and Canada for the second quarter will be about 93 per cent of the production in the corresponding period of 1956. For the first six months of 1957, GM's total production will be about 91 per cent of the total produced in the first half of 1956, he reported.

Discussing the national economy, he said that since the beginning of this year "consumer expenditures for durable goods, including new homes, automobiles and appliances, have been at a slower rate."

"On the other hand, expenditures for non-durable goods and for services have increased to record rates," Mr. Curtice said. "Total consumer spending is at an all-time high. Capital expenditures by business are likewise at an all-time high, while expenditures by government are rising."

Mercury Milestone Car Is Built at L. A. Plant

Mercury Div. of Ford Motor Co. turned out its three millionth car on June 4. The milestone car—a Montclair Phaeton sedan—came off the assembly line at the division's Los Angeles plant.

Atomic Energy Applications To Oil Are Explored by Gulf

Gulf Oil Corp. has launched full-scale operation of its new A. W. Mellon Nuclear Science Laboratory at its Harmarville, Pa., Research Center. Already begun are research projects which range from recovering more oil by atomic methods, to possibilities of improving refining by radiation, to creating entirely new products by nuclear energy, to speeding research by "tracer" studies.

This program has been thrown into high gear by the activation of the laboratory's principal unit—a 3,000,000 volt "atom smasher," known as a Van de Graaff particle accelerator. The machine is a versatile radiation source and a powerful tool for producing beams of electrons, protons, neutrons, and penetrating or "hard" X-rays applicable to research.

Nuclear studies are being pushed into the discovery and recovery of crude oil. Included is "nuclear well logging," in which oil field rocks are bombarded from the bore hole with gamma rays and/or neutrons to chart their composition and fluid content. The data obtained may locate oil that is otherwise undiscoverable.

In refining and in the manufacture of new products, research now in progress could also lead to commercial application of nuclear energy. Of major significance in this sphere are investigations into the irradiation of catalysts. The laboratory is also probing the radiation substitution for heat with the hope of thus producing new chemical and petrochemical products.

Irradiation has already been used to produce, from refinery gases, the highest quality gasoline component, hexamethylethane, which has 130 octane rating. While its cost is so far prohibitive, the accomplishment illustrates radiation possibilities.

White Buys Assets of Reo; Reported Eying Diamond T

The acquisition of Reo Motors by White Motor Co. last month once again has given rise to rumors that White also might acquire Diamond T Motor Car Co. Both White and Diamond T deny any moves in that direction, despite persistent reports that hint at an eventual merger of the two firms.

One of these is a report that two big blocks of Diamond T stock were sold recently or will be sold. These include 137,400 shares owned by Bohn Aluminum & Brass Corp., which at one time wanted to merge Reo with Diamond T, and 100,000 shares held or controlled by C. Russell Feldmann.



BRITISH CARGO CARRIER HAS 100 CU FT OF SPACE

This Comer half-ton delivery van shares many parts with the Rootes Group's Hillman Minx. The 85 cu in. engine develops 47 bhp at 4400 rpm. It drives through a four-speed gearbox, which is side-mounted to increase floor space. Body and underframe are of unitary construction, and large rear windows give good rearward visibility.

Mr. Feldmann is an industrialist who became prominent in the Diamond T picture by purchasing a large block of stock held by the estate of the late C. A. Tilt, former chairman of Diamond T. Diamond T has about 421,000 shares outstanding.

The acquisition of Reo by White marks the third time in three years that the Lansing, Mich., truck builder has passed to a new management. It is the fourth company to be acquired by White since 1951.

Although purchase price was not disclosed, it is understood White acquired the Reo assets for around $4 million. Reo reportedly has assets totaling $13 million.

No changes are contemplated at present in the Reo set-up. It will operate as a division of White, and John C. Tooker, former Reo president, becomes general manager of the division. Reo's general offices in Lansing, including manufacturing and sales, will continue to remain in that city.

The advantages which will accrue from the merger are obvious. Although Reo in the past year or so has been strengthening its dealer body, it will now be able to utilize White's stronger sales and distribution organization. This includes 42 company-owned sales and service centers, 205 independent distributors, and about 160 dealers. Reo itself last year had approximately 520 dealers.

In turn, White will obtain some two million sq ft of Reo's manufacturing space, including a highly automated engine production line. Reo also would provide White with an additional source for engines, including the V-8 engine it brought out three years ago. White currently buys all of its engines from outside suppliers.

New Engine Fan Developed For Air-Conditioned Cars

A new fan drive which permits faster fan speeds when the engine is idling, yet runs slower than the engine at higher speeds, has been developed by Buick to prevent engine overheating in air-conditioned cars operating at slow speeds. The new fan is connected to the engine by a silicone fluid clutch. It idles at 581 rpm, which is faster than the engine, yet will not exceed 2000 rpm at speeds of 65 mph and over.

The silicone fluid drive unit acts like a solid connection until a certain speed and torque are reached. The fluid then slips to let the fan run at its predetermined speed.

Low-Nickel Grades May Assure Greater Stainless Use in Cars

The automobile industry, already the largest direct customer for stainless steel, is apparently on the way to increasing its demands still further. According to the American Iron and Steel Institute, that trend is pointed up by two facts: recent steady increases in per-car uses, and the probability of still higher automobile production.

In higher-priced cars, the use of stainless has increased to as much as 75 lb per car. The low-priced three now use an average of 24.3 lb, compared to 20 last year.

Due to developments in the low-nickel grades—the 200 series—car producers should not be handicapped by the continuing nickel scarcity. Straight chrome types are hardly affected; the low-nickel grades will ease any problems where the chrome types are less practical than chromium-nickel stainless.

NEWS AUTOMOTIVE AND AVIATION



ELECTRONIC TOE-IN SETTER AT CHEVROLET

This electronically operated device, which has been installed in Chevrolet's Tarrytown, N. Y., assembly plant, will set car wheel toe-in to within 1/64th of an inch. Settings are obtained on all wheels at one time or singly with front wheels rotating at a road speed equivalent to 30 mph. Dials register correction needed.

ASTE Tool Show Scheduled In Philadelphia May 1-8

Philadelphia's Convention Center has been selected as the site for the 1958 Tool Show of the American Society of Tool Engineers. The show will be open May 1-8 from 9 a.m. to 6 p.m.

As in the past, a complete integrated technical program will be offered, including papers, panels, seminars, plant tours, and related activities. Exhibitor space assignments for the show began this month (June).

Key Role of Market Research In Edsel Development Marked

The importance of market research and the role it played in the development of the forthcoming new Edsel car was outlined recently in New York City by J. Emmet Judge, merchandising and product planning manager of Edsel Div. of Ford Motor Co.

Speaking before a Textile Market Research Conference sponsored by the National Cotton Council, Mr. Judge reviewed the many years of thinking and planning behind the car that is to be publicly introduced this Fall. He pointed out that while the final decision to launch a new line of cars was not made until April of 1955, market research studies started in the Fall of 1948.

Long before the Ford executive committee actually allocated $250 million and authorized the Edsel line, there had been a growing awareness in the company that it was not getting as big a slice of the rich medium-price car market as it should. The principal reason, of course, lay in the fact that Ford had only one car (Mercury) in the field, while General Motors and Chrysler had several contenders.

As a matter of fact, according to Mr. Judge, nearly 80 per cent of Ford's volume has been in the low-price field and only 20 per cent in other areas. Its principal competitors have much broader spreads, so Ford concluded it should go more across the board. This decision was reinforced by findings which indicated that consumers are currently spending a large percentage of car dollars in the medium-price field.

Mr. Judge also candidly disclosed the results of other studies showing that although 87 per cent of Chevrolet owners "trade-up" to medium-price General Motors cars, only 26 per cent of Ford car owners have been moving up to Mercury. Putting it another way, General Motors Corp. retains on an over-all basis 82 per cent of its owners, while Ford Motor Co. has been keeping only 69 per cent "in the family." Ford expects the Edsel to help boost this ratio to at least 74 per cent.

Du Pont Plans Expansion Of Facilities for Teflon

Du Pont Co. has announced plans for a major expansion of its facilities at the Washington Works, Parkersburg, W. Va., for producing Teflon fluorocarbon resins. Production of all four commercial tetrafluoroethylene resins will be increased.

At the same time, Du Pont appropriated substantial funds for design of a plant to produce an experimental product, Teflon 100-X perfluorocarbon resin. The new material, which supplements the present Du Pont line of Teflon tetrafluoroethylene resins, has a melt viscosity low enough to permit extrusion in standard equipment.

The new resin is expected to accelerate the development of applications previously not attempted because of processing difficulties. It is expected to broaden the usage of true fluorocarbon resins for such products as jackets for coaxial and multi-conductor cable, aircraft and industrial wiring, flexible and rigid printed circuits, packaging for corrosive material, etc. Du Pont is also considering the manufacture of film from Teflon 100-X.

One Million UAW Workers Win Eight-Cent Pay Hike

Pay envelopes of some one million hourly automobile workers were fattened again this month. The boost amounts to eight cents an hour. It includes an increase of two cents an hour as a result of an advance in the cost-of-living index, and an additional six cents provided under the "improvement factor" in contracts between the UAW and automobile companies.

The total cost-of-living factor in the pay of automobile workers will amount to 16 cents an hour through June, July and August. Salaried workers receive similar increases in their quarterly cost-of-living allowances.

A sharp rise in food prices was the chief factor in bringing the Government's cost-of-living index to a new high of 119.3 as of April 15, compared with 118.2 on Jan. 15. The figure is 3.8 per cent higher than April, 1956.

$10 Million Borg-Warner Plant Starts Output On New Plastic

Production began this month at Borg-Warner's new $10 million chemical plant near Parkersburg, W. Va. It will make a new heat-resistant plastic material known as Cycolac resin, which will be used for more than 100 different products. The plant is being operated by B-W's Marbon Chemical Div.



BOMARC MISSILE READY

A Boeing IM-99 Bomarc interceptor missile is shown in firing position at the Air Force Missile Test Center, Patrick Air Force Base, Fla. Visible in this photo is one of the two Marquardt ramjet engines which power the missile for cruising flight after launching by an Aerojet-General liquid fuel rocket motor.

Automobile Show Off for Jan.; Next Scheduled for Fall of '58

There will be no National Automobile Show next January. Although no formal announcement has been made, all plans have been cancelled by the Automobile Manufacturers Association for a 1958 show. AMA directors reportedly have voted to hold a 1959 show instead.

Dates for the 1959 show have not been set as yet, but it is hoped that a suitable date in November, 1958, can be found to display the 1959 models.

No official reason was given for the cancellation, but the seemingly unavoidable conflict with the dates of the Chicago Automobile Show was undoubtedly the main factor.

Reo Adds New Diesel Trucks And Tractors to Heavy Line

Reo Motors is introducing this month the latest additions to its line of heavy-duty vehicles called the B-Series Diesels.

The Reo B-Series line consists of: three 4 by 2 and four 6 by 4 trucks; three off-highway trucks; and six tractor models. The single-axle units are engineered for gross vehicle weights to 42,000 lb and the tandem-axle units up to 63,000 lb. The B-Series tractor models are designed for gross combination weights of 65,000 to 85,000 lb.

A choice of nine Cummins heavy-duty Diesels are offered in the Reo B-Series. These power plants are the: HR-6-B; HRF-6-B; NH-6-B; NT-6-B; NTO-6-B; NHS-6-B; NHRS-6-B; NRT-6-B; and NRTO-6-B.

AI TABLOID

Reynolds Metals Co. has developed a zinc-clad aluminum car radiator on an experimental basis.

* * *

Gulf Research & Development Co. has played a major role in development of a new hydroisomerization process that is said to increase substantially the percentage of high octane gasoline obtainable from a barrel of crude oil.

* * *

Fischer & Porter Co. and Paterson Engineering Co., Ltd., have formed a new British company to be known as Chlorination Equipment, Ltd.

* * *

Tung-Sol Electric, Inc., has acquired Chatham Electronics Div. of Gera Corp. . . . Superior Tool & Die Co. has acquired a major share of the outstanding common stock of Bethlehem Foundry & Machine Co.

* * *

Republic Steel Corp. predicts that the gross national product may reach $560 billion or more by 1965.

* * *

Westinghouse Electric Corp. has formed a Manufactured Products Dept. in its Manufacturing and Repair Div.

* * *

North American Aviation, Inc., has been awarded an Air Force design study contract for development of a long-range interceptor plane.

* * *

Pennsylvania Salt Mfg Co. has changed its name to Pennsalt Chemicals Corp.

* * *

B. F. Goodrich Industrial Products Co. plans to build a new $2.5 million plant for the manufacture of adhesives in Akron, O.

* * *

U. S. industry is expected to consume over one million pounds of lithium metal annually by 1970.

* * *

National Bureau of Standards has experimentally produced in ultra-high-strength steel that can be heat-treated to a strength of 285,000 lb/in. with sufficient ductility for structural applications.

Black & Decker Mfg. Co. has opened a new factory service and sales branch in Washington, D. C.

* * *

Douglas Aircraft Co. recently dedicated its new $20 million DC-8 jetliner manufacturing plant at Long Beach, Calif. . . . Tidewater Oil Co. recently dedicated its new $200 million electronically controlled oil refinery at Delaware City, Del.

* * *

Lockheed Aircraft Corp. states that it could build an atom-powered plane in three years after a go-ahead from the Government.

* * *

The atomic energy industry is expected to spend more than $500 million this year on construction of reactors, uranium mining and milling, instrument manufacture, and research.

* * *

The Army has awarded a contract for research on a helicopter concept to Convertawnings, Inc.

* * *

Standard Pressed Steel Co. will build a 55,000-sq ft addition to its main Jenkintown, Pa., plant this year, primarily to increase production of new precision fasteners.

* * *

Foreign automobile assembly plants in Mexico have been granted a ten per cent price increase for new cars and trucks.

* * *

Crucible Steel Co. of America has opened its new specialty steel warehouse at 8610 Page Blvd., St. Louis, Mo.

* * *

Dow Chemical Co. has started construction on a new petrochemicals plant at Bay City, Mich. . . . Dow Corning Corp. is building a new plant for manufacturing silicone consumer products at Greensboro, N. C.

* * *

Ward Products Corp. has transferred its operations to Amsterdam, N. Y., from Ashtabula, O.

* * *

Joseph T. Ryerson & Son, Inc., has announced a sizable expansion program for its Pittsburgh, Pa., steel service plant.

(Turn to page 94, please)

News AUTOMOTIVE AND AVIATION



TRUCK DRIVERS RIDE ON AIR WITH NEW GMC AXLE

Production line workers at GMC Truck & Coach Div. in Pontiac, Mich., lower a tubular front air suspension axle onto a truck frame in the early stages of construction of a GMC Air Suspension tractor that has air bellows instead of steel springs. Upside down at this stage of production, the chassis is turned over later for further assembly operations. Insert shows cut-away view of the hollow air suspension axle.

Edsel Production Due To Get Underway Soon

Production of Ford's new Edsel car, scheduled for introduction this Fall, will start July 15. Leading the 1958 model parade, the car already is in pilot production at the company's Mahwah, N. J., assembly plant, one of six plants which will build it. Ford is shooting for a production goal of 200,000 Edsels during the coming model year.

ACF Industries Forms Advanced Products Div.

ACF Industries, Inc., has formed a new operating division. To be called the Advanced Products Div., it will concentrate on products manufactured for the petroleum, gas, chemical and nuclear energy industries.

In addition, the new division will specialize in pressed-metal items, special weldments, tank cars (except underframes), aluminum and new metals fabricated products, aircraft and missile components, ordnance products, and weapons systems. Rudolph Furrer, ACF vice-president of manufacturing and engineering, will serve as president of the new division.

GM Top Newspaper Advertiser For 10th Straight Year in '56

For the 10th straight year, General Motors Corp. led all companies in newspaper advertising expenditures of $53.77 million in 1956. Ford ranked second with expenditures of $25.36 million, and Chrysler held its number three position with outlays of $17.94 million.

Two GM Divisions Win New Government Orders

Two General Motors divisions shared in Government contracts awarded recently. Chevrolet Div. received $5.77 million for sedans and $1.08 million for half-ton trucks. GMC Truck and Coach Div. got $1.56 million for five-ton tractors it was reported.

Ford Buys Philco Plant For Vinyl Production

Ford Div. has purchased a 235,000 sq ft plant in Mt. Clemens, Mich., from Philco Corp. Reported to cost $1.45 million, the one-story building will be used by Ford to house its vinyl products manufacturing facilities, currently located at the Highland Park plant.

The plant will enable Ford to increase the variety of vinyl fabrics it produces for cars and trucks. It will include improved facilities for research and development on automotive fabrics.

Purchase of the plant marks another move by Ford toward making more of its own parts and materials. The company, however, emphasizes that it will continue to purchase a "substantial" portion of vinyl products from outside sources.

Canadian Automotive Market To Boom in Coming 25 Years

Sun Life Assurance Co. has recently released an interesting report on prospects for the automotive industry in Canada for the next 25 years. The study looks for Canada to have by 1980, when population is expected to be 26 million persons *versus* 16.5 million now:

Nine million cars on the highways.

Two cars in one million homes.

A 40 per cent to 70 per cent increase in automotive employment, despite automation.

Average capital expenditures of $75 million to $100 million a year by the automotive industry.

Lower car prices than now on cars.

The insurance company's study sees production and sales of 890,000 passenger cars and 196,000 commercial vehicles in a typical year between 1975 and 1980. Current sales are 375,000 passenger cars and 87,800 commercial vehicles a year.

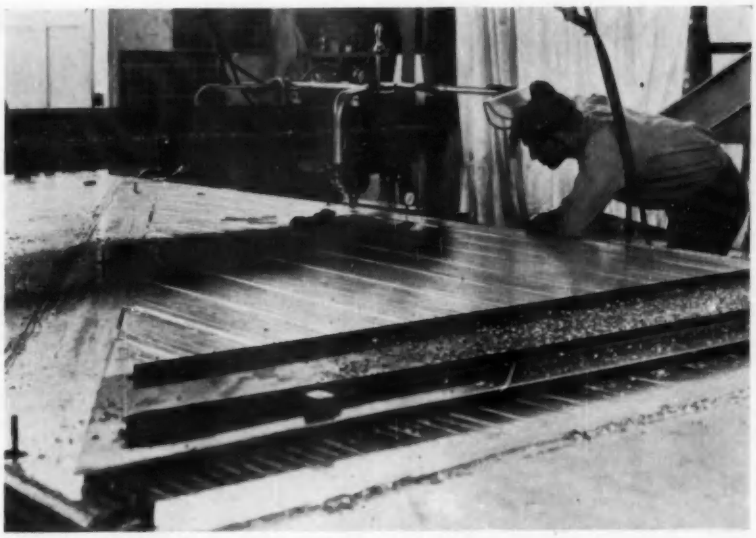
Sun Life estimates that in 1955 the average retail list price of a four-door sedan was $2192 in Canada, as against $1788 in the U. S. Canadian car prices are believed to be higher for three basic reasons: higher taxes, higher manufacturing costs, and higher wholesale and retail distribution costs. The gap between the two countries should narrow as Canadian manufacturing volume increases.

Canada's over-all economy is expected to grow in a spectacular way in the years ahead. The number of Canadians earning $5000 a year or more is expected to show a six-fold increase to about 2.625 million persons by 1980. This income group forms, a large potential new car market.

Car Producers to De-emphasize Power, Speed in Merchandising

The Automobile Manufacturers Association has passed a resolution aimed at playing down speed, horsepower, and racing in automobile merchandising. Of far-reaching importance, the recommendation in theory outlaws factory participation in stock car racing, speed and acceleration tests, and such related activities as providing a pace car for the Indianapolis Race. Advertising of race results is also to be terminated.

Automobile manufacturers are urged to soft pedal speed and horsepower and "encourage owners and drivers to evaluate passenger cars in terms of useful power and ability to afford safe, reliable, and comfortable transportation, rather than in terms of capacity for speed." It will be up to the factories to decide what to do about dealer advertising of speed. The AMA resolution only states that manufacturers are not "to encourage or assist" dealers in such practices.



MACHINED AND SCULPTURED SKINS FOR JETS

Machined and sculptured skin panels cut from solid aluminum alloys are now commonly used in the aircraft industry to obtain light and efficient structures. Shown here being cavity milled at the plant of Tapered Air Products Corp., Lynwood, Calif., is an upper wing skin for a Convair F-102A jet fighter-interceptor. Raw 24St Alclad stock, 5/16 in. thick, is finished down to sections as thin as 0.055 in. with as much as 75 per cent of the metal removed. Operator keeps constant check on thickness.

Boeing Reports Record Sales For Initial Quarter of 1957

Boeing Airplane Co. has reported record sales of $292,711,969 and net earnings of $8,075,464 for the first three months of 1957. This compared to sales of $170,879,889 and net earnings of $6,156,677 for the same period in 1956.

As of March 31, unfilled orders totaled $2.848 billion. Approximately $660 million, or 23 per cent of this represents orders for 134 commercial jets for which the company had firm orders as of Mar. 31. Letters of intent under Government programs are included in the backlog only to the extent that funds had been allotted as of the end of March.

Automatic Brakes On Cars Unfeasible, Chrysler Says

Discussed much and predicted by some for the near future, automatic brakes on cars, including radar-controlled systems, appear to be out of the picture, at least for some time to come. That is the opinion of Roy C. Haeusler, automotive safety engineer of Chrysler Corp., who maintains that the human mind is still far superior to any radar system yet developed.

Describing a series of simulated radar-controlled driving tests conducted by Chrysler last year on Detroit streets, Haeusler says, "It became clear that the complexity of the traffic problem and the assorted human responses would indefinitely postpone the development of an entirely successful automatic brake control system."

Control of car brakes, actuated in accordance with a closely defined pattern worked out beforehand by the company's engineers, "almost drove the driver out of his mind," Haeusler declared. The "automatic" control was provided by a research engineer who sat to the right of the driver and applied an extra brake pedal according to the pattern.

"As the car was about to enter a curve and before the driver started to turn the wheel, the 'radar' would 'see' objects alongside the curve such as mailboxes, houses, or approaching cars. It could not anticipate that the driver would turn the wheel and stay in his proper lane so the 'radar' applied the brakes.

"If another car traveling in the same direction cut in front of the 'radar-equipped' car," Haeusler said, "the automatic control would apply the brakes, regardless of the fact that a third car might be close behind. Narrowing the beam so it would not apply brakes for cars parked at the curb, was one of its greatest limitations."

"Our simulated system was no help, for example, against such hazards as a child dashing in front of the car from the curb," he said. "Nor would it work when two cars approached at right angles at an unmarked street intersection."

Firestone Sees Record Year For Replacement Tire Sales

Lee R. Jackson, vice-chairman of Firestone Tire & Rubber Co., says the rubber industry is in a period of strong, steady growth, and the future appears optimistic. Firestone is completing a large construction program.

Recently, the company put a multimillion dollar butadiene plant into operation in Orange, Tex. It will supply Firestone's two synthetic rubber plants with the basic raw material for synthetic.

Three other manufacturing plants will be completed within the next few months. One, in Noblesville, Ind., will produce air springs. The other two, in Manila and Havana, will make tires.

Mr. Jackson estimates that replacement tire sales this year will reach about 56 million units, well above the previous record year of 1946 when 54 million were sold. He estimated total tire shipments for the industry during 1957 at about 108 million.

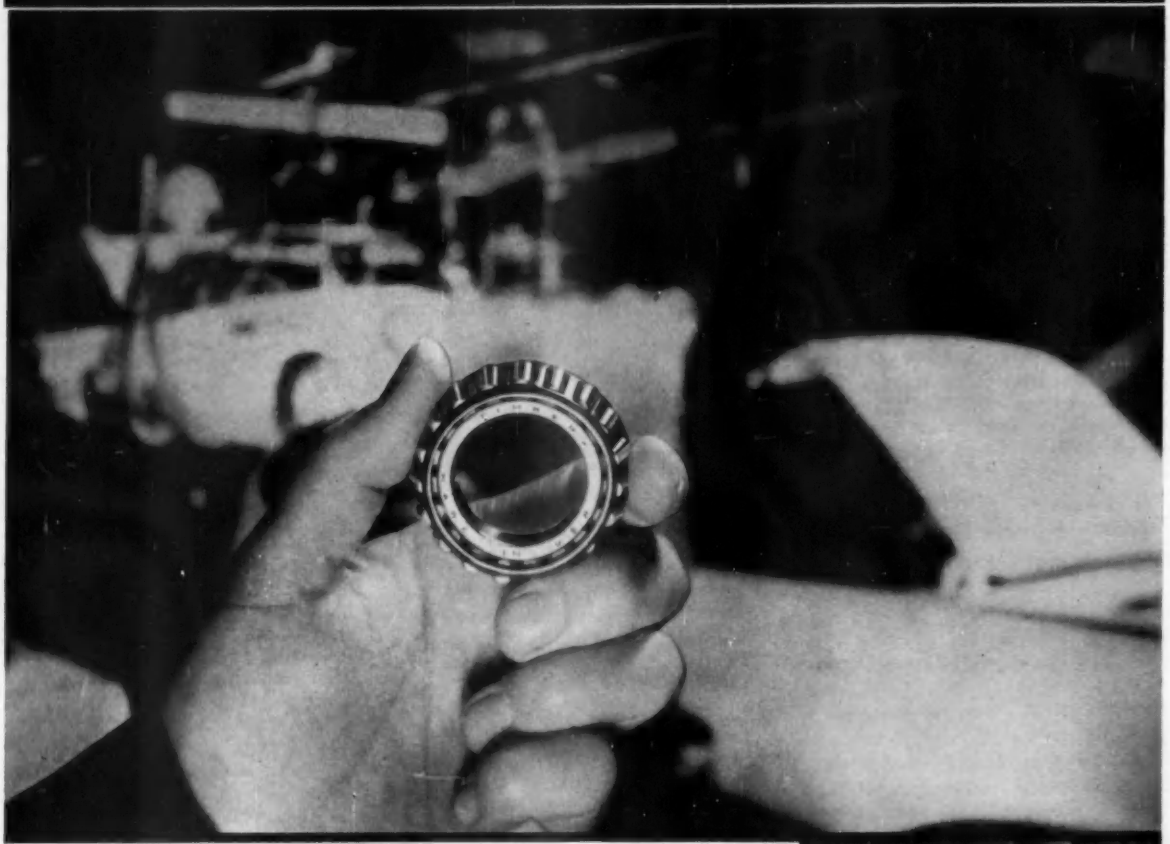
Epoxy Resin Uses Broaden

About 70 per cent of the epoxy resins produced in this country go into surface coatings, but a rapidly growing use is in metal-forming dies, die facings, and fixtures. Last year these uses took about seven million lb of the material. High-strength adhesives for jet aircraft are using the chemical compounds also.

(Turn to page 94, please)

Meeting the big change in cars with the big change in bearings:

TIMKEN® and The Moto-Mated Way



Get a better bearing and save up to 15%

LONGER, lower, sleeker, faster, more powerful cars are revolutionizing the automobile industry. And the new cars coming off the production line (above), place new and greater demands on component parts. Meeting the big change in cars is the big change in bearings—Timken and the Moto-Mated Way. It's a whole new concept in bearing design, manufacture and supply—*mated* to the needs of the dynamic automotive industry.

From the Moto-Mated Way comes a new breed of Timken® tapered roller bearings in 13 standardized sizes. New, lighter bearings to reduce unsprung weight. Smaller bearings that save space—permit more compact design. Bearings that are capacity packed to take the increasing loads of driving today's powerful cars.

And because they are produced by machinery and methods revolutionary in the bearing industry, the new bearings cost less. They give automakers an area of economy in their otherwise spiraling manufacturing cost.

Carmakers have already saved 14.6% in bearing costs for millions of front wheels on 1957 cars. And savings up to 15% are possible as designs are adapted to make use of Timken Moto-Mated bearings in rear wheels, pinions and differentials. As your use of the new bearings grows, we can pass still further manufacturing savings along to you.

Whether you're designers, production engineers or purchasing men, now, more than ever, Timken bearings are your No. 1 value. The Timken Roller Bearing Company, Canton 6, O. Canadian plant: St. Thomas, Ontario. Cable: "TIMROSCO".



QUALITY, SERVICE, PUBLIC ACCEPTANCE MAKE

TIMKEN

TRADE MARK REG. U.S. PAT. OFF.

TAPERED ROLLER BEARINGS

YOUR NO. 1 BEARING VALUE

MEN IN THE NEWS



Heald Machine Co.—Edwin J. Keyes was elevated to vice-president and works manager, and Raymond A. St. John was promoted to vice-president and general sales manager.



Ford Motor Co.—Robert S. McNamara was elected group vice-president in charge of the car and truck divisions, and James O. Wright was elected vice-president and general manager of Ford Div.



Cincinnati Milling Machine Co.—Hayward A. Gay was named manager of the Machine Tool Div., and Philip O. Geier, Jr., was named manager of the Products Div.

Ford Motor Co.—**L. D. Crusoe** has retired as executive vice-president. **John S. Bugas** was elected a group vice-president; **Tom Lilley**, vice-president and general manager of the International Div.; **Arjay R. Miller**, vice-president and controller, **Earl G. Ward**, vice-president for purchasing.

Bendix Aviation Corp.—**Charles D. Manhart** has been appointed staff director, military Government sales.

General Motors Acceptance Corp.—**John O. Zimmerman** has been elected executive vice-president in charge of the financial staff.

Crucible Steel Co. of America — **Geo. W. Stamm** was elected vice-president and general manager of sales.

Olin Mathieson Chemical Corp. — **Stanley W. Koenig** has been promoted to director of advertising.

Goodyear Tire & Rubber Co.—**W. S. Wolfe** is now director of domestic production; **W. H. Rudder**, manager of domestic tire production; **J. E. Stafford**, manager of industrial products production; **R. A. Jay**, head of plant planning and methods and machine design; and **Leroy Tomkinson**, head of Akron production operations.

Timken Roller Bearing Co., Automotive Div.—**R. L. Williams** has been promoted to assistant chief engineer.

Aluminum Co. of America—**George E. Herrman** was named manager of commercial automotive sales.

Vickers, Inc., Machinery Hydraulics Div.—**Russell Dupuis** has been made manufacturing manager; **John Slack**, plant manager at Omaha, Neb.; **Thomas O. Brown**, plant manager at Waterbury, Conn.; **A. W. Agnew**, plant manager at El Segundo, Calif.; **Robert A. Erskine**, chief engineer, Industrial Dept.; **Carl E. Gunther**, chief engineer, Marine and Ordnance Dept.; and **F. V. Gieryn**, sales manager, Industrial Dept.

General Electric Co. — **Gordon C. George** has been named manager of sales for the Flight Propulsion Laboratory Dept.

Vanadium Corp. of America—**A. F. Sprankle was** made technical director and assistant vice-president.

Borg-Warner Corp., Ingersoll Steel Div.—**Howard E. Morison** has been appointed vice-president.

White Motor Co.—**William L. Peterson** has been named director of sales promotion and advertising.

Plymouth Div., Chrysler Corp. — **Marx L. Kristek** is now manufacturing manager of the Detroit assembly plant.

(*Turn to page 94, please*)



Continental Aviation & Engineering Corp.—Ray P. Powers is now vice-president and assistant manager.



Olin Mathieson Chemical Corp. — R. Carter Dye is now aluminum general sales manager.

Necrology

Joseph P. Armitage, 76, vice-president and consultant and former engineering vice-president of Kearney & Trecker Corp., died recently, at Milwaukee, Wis.

Oliver A. Gottschalk, 61, treasurer and controller of Carborundum Co., died May 26, at Niagara Falls, N. Y.

Hubert Hollman, executive engineer of Brad Foote Gear Works, Inc., died May 22, at Chicago, Ill.

John S. Seltzer, 55, manager of purchases and production planning for Jack & Heintz, Inc., died May 14, at Cleveland, O.

Leon A. Daughty, 70, president of C & D Batteries, Inc., died May 18, at Glenside, Pa.

Richard J. Brittain, 64, chief engineer of the Harrison, N. J., plant of Hyatt Roller Bearing Div. of General Motors Corp., died May 24, at Berkeley Heights, N. J.

Harry T. Paterson, 46, operational manager of the Harbor Island and Kure Beach Corrosion Test Stations of International Nickel Co., Inc., died May 27, at Wilmington, N. C.

Leon F. Banigan, 70, former editor of Chilton's old *Automobile Trade Journal*, died May 24, at Montclair, N. J.

Bernard J. Keating, 72, board chairman and treasurer of Standard Tool and Manufacturing Co., died June 1, at Kearny, N. J.

Specify Muskegon design for '58 and '59

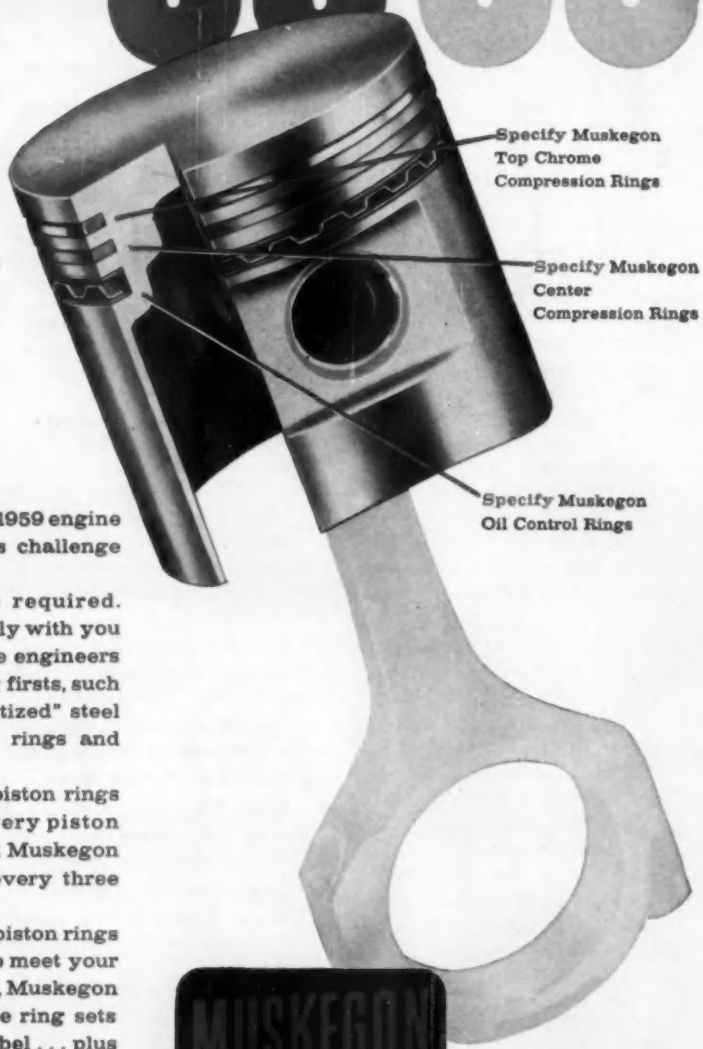












Here's Why -

Piston rings must keep pace with your 1958-1959 engine developments—and Muskegon meets this challenge these three ways:

1) METALS: New compositions may be required. Muskegon metallurgists cooperate closely with you in developing them. You'll work with the engineers responsible for many famous piston ring firsts, such as sintered powdered metal rings, "Unitized" steel oil rings, chrome plated "Unitized" oil rings and lapped chromium plated steel segments.

2) DESIGNS: Muskegon engineers design piston rings to meet the exact requirements of every piston groove. This precise engineering has put Muskegon piston rings in more than one out of every three new cars on the road today.

3) PRODUCTION: Regardless of how many piston rings you may need, Muskegon stands ready to meet your requirements, when you need them. And, Muskegon is also equipped to produce your service ring sets completely packaged with your own label . . . plus rings for transmissions, power steering and air conditioning compressors.

Metals, designs, production—it all adds up to the best piston rings ever for your better-than-ever 1958-1959 engines. So . . . let Muskegon plan and work with you now . . . for better design and performance in the years ahead.

MUSKEGON Piston Ring Co.

PLANTS AT
MUSKEGON, MICHIGAN
SPARTA, MICHIGAN
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Since 1921... The engine builders' source!

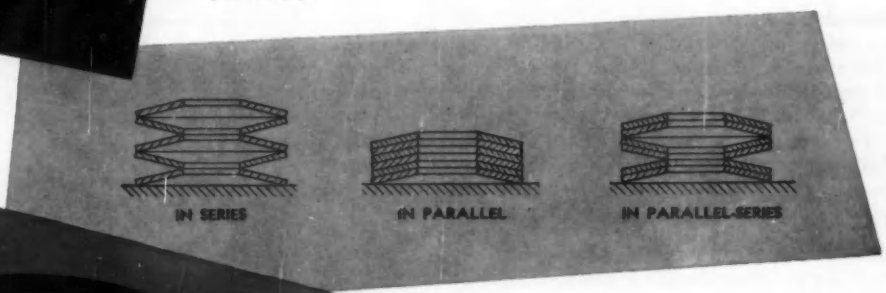
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Solve Spring Problems of HIGH LOADS in a Limited Space



.025 THICK STEEL
10 WASHERS IN SERIES
35 LBS. AT .250 DEFLECTION

This useful type of spring may be the answer to your need where space and load requirements are a problem. Made to any diameter or thickness—can be stacked in series, parallel, or parallel-series, or as an "Energy* Cartridge." The experience of our engineers is available in a pamphlet, "Belleville Washers." Write for your copy.





.125 THICK STEEL
4 WASHERS IN PARALLEL
8000 LBS. AT .025 DEFLECTION



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SYRACUSE 9 (Salina), N.Y.

MILWAUKEE DIVISION
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MILWAUKEE, WIS.

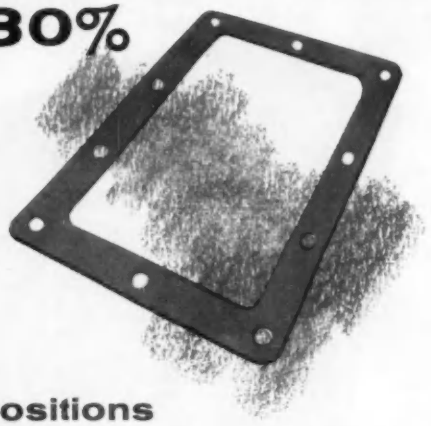
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NEW Accopac asbestos materials cut gasket costs 15 to 30%



Your asbestos gasketing costs may be cut by as much as 30% with the new Accopac® asbestos materials made by Armstrong.

These new materials are beater-saturated with your choice of synthetic rubbers. They're tough and flexible, won't crack or pipe on bending. They die-cut cleanly. And they seal perfectly at flange pressures as low as 2,000 psi.

Brief specifications on the new Accopac materials are given below. For more detailed information—and samples—write to Armstrong Cork Company, Industrial Division, 7004 Dean St., Lancaster, Pa.

Armstrong Accopac Asbestos Compositions

General Information

Accopac asbestos materials are made by a patented modification of the beater saturation process. Although they are typical Armstrong quality, they're inexpensive because they are made by an exclusive formulation in continuous rolls—literally by the mile.

In the Accopac process, individual fibers are coated with a synthetic latex binder before the sheet is formed. The result is a strong, homogeneous material. Even in very thin gauges, Accopac asbestos sheets are tough and flexible.

Characteristics and Uses

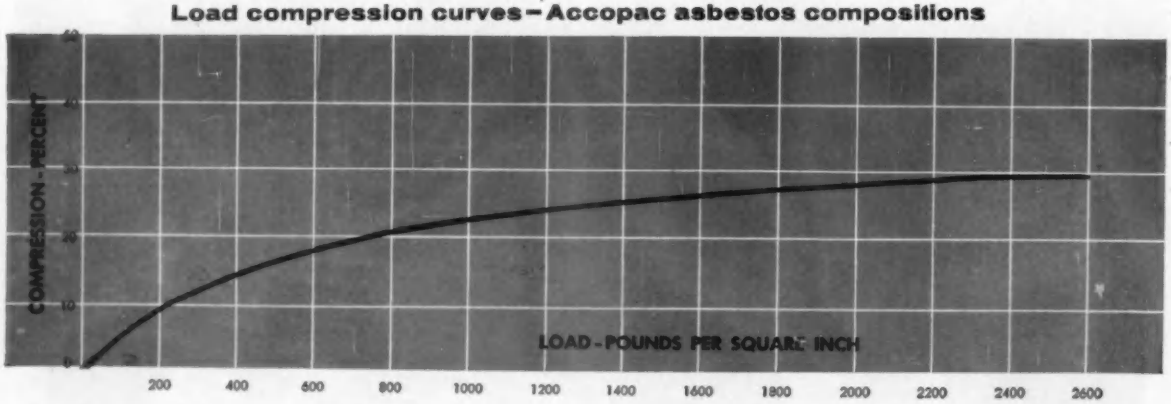
Accopac asbestos materials are recommended for moderate to heavy-duty service. They should be considered for applications where compressed asbestos sheets are now being used.

To provide resistance against a wide variety of oils, solvents, chemicals, and gases, Accopac asbestos sheets are offered with a choice of synthetic latex binders including styrene-type (Buna S), nitrile-type (Buna N) and chloroprene-type (neoprene).

All Accopac asbestos sheets are moderately compressible. They will seal at flange pressures as low as 2,000 psi.

TYPE	BINDER	TENSILE STRENGTH MINIMUM PSI AMD	PER CENT COMPRESSIBILITY
AS-428	Styrene-type rubber (Buna S)	1200	17-27 (1000 psi) 30-40 (5000 psi)
AD-838	Chloroprene-type synthetic rubber (neoprene)	1200	
AN-859	Nitrile-type synthetic rubber (Buna N)	1700	

Load compression curves—Accopac asbestos compositions



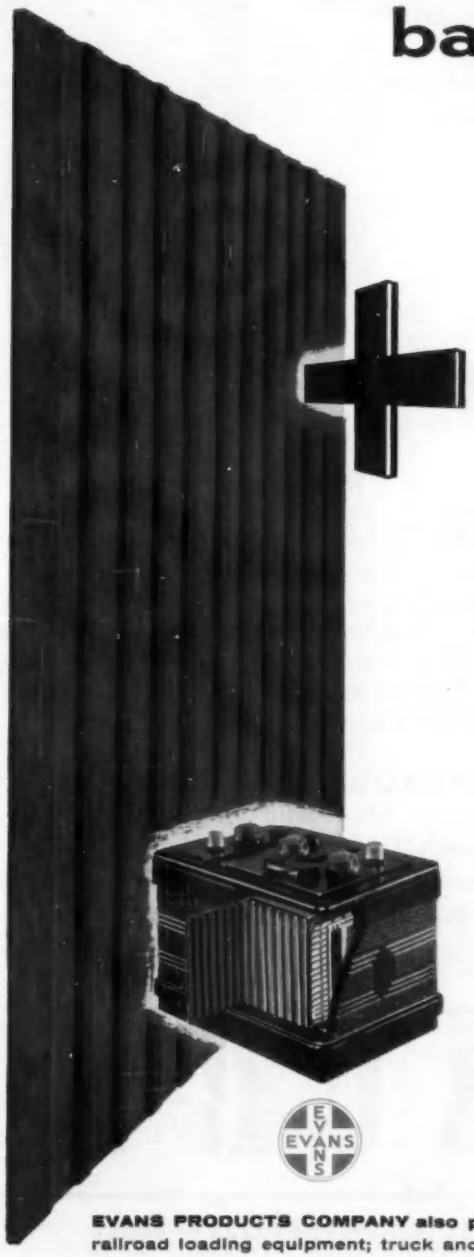
You'll find more helpful information on the whole line of Accopac fiber sheet gasket materials in this new folder. Write for your copy today. Address Armstrong Cork Company, Industrial Division, 7006 Imperial Ave., Lancaster, Pa.



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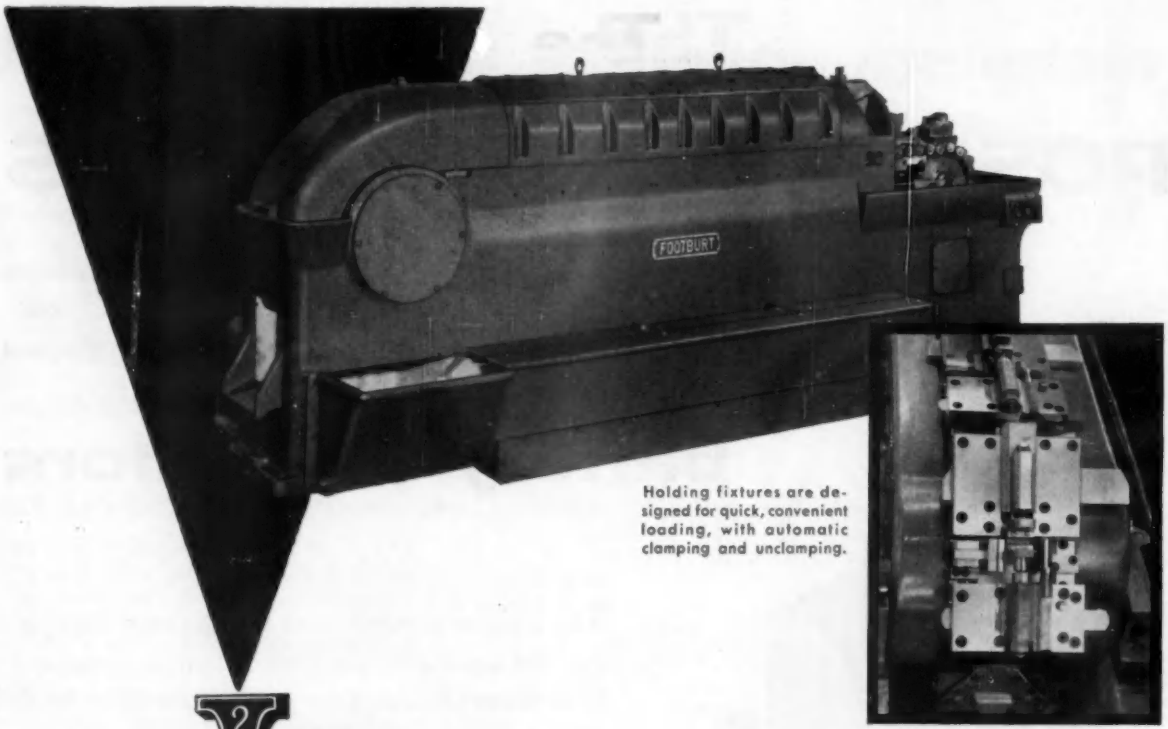
Evans has made more battery separators than anyone else in the world, and that long experience has contributed greatly to the design and production of the new fortified Evanite separator. If you make or merchandise batteries, you should incorporate all the positive advantages of Evanite into your product. Write us today for complete details. Evans Products Company, Dept. P-6, Plymouth, Michigan.

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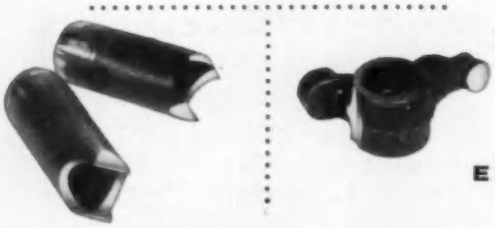
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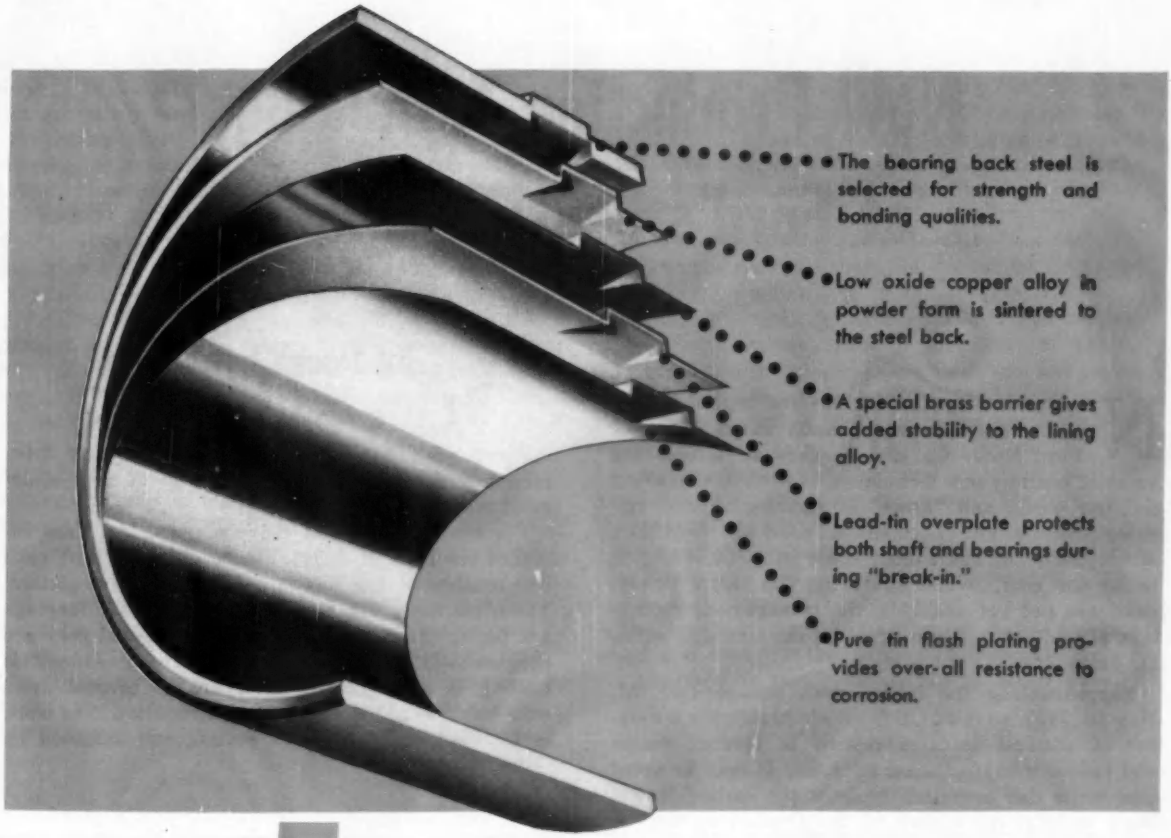
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RESEARCH · DESIGN · METALLURGY · PRECISION MANUFACTURING

New Production Techniques at Ford's Sterling Plant

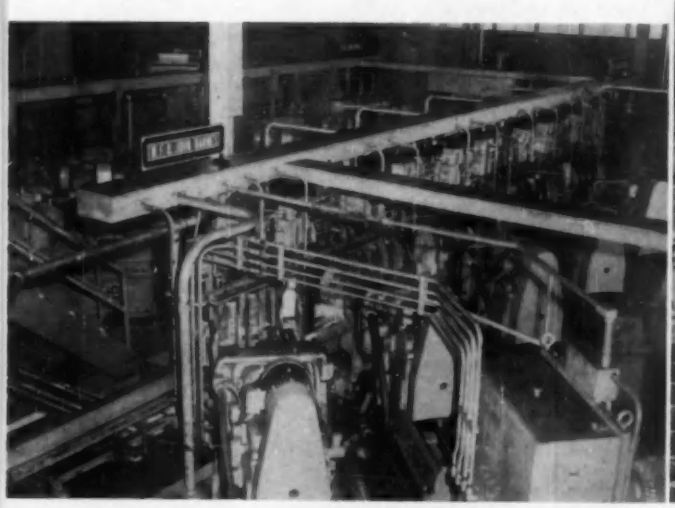
By Joseph Geschelin

NOTABLE for its physical size and capital investment, the Sterling Chassis Parts Plant of Ford Motor Co. also displays an astonishing array of entirely new techniques, new ways of making familiar parts, and "firsts" in automation and machine tool design. Located in Sterling Township, Mich., the plant has a floor space of 1,800,000 sq ft under one roof. While figures on the entire investment are not yet available, the management reports that $18 million has been spent on the land and buildings alone.

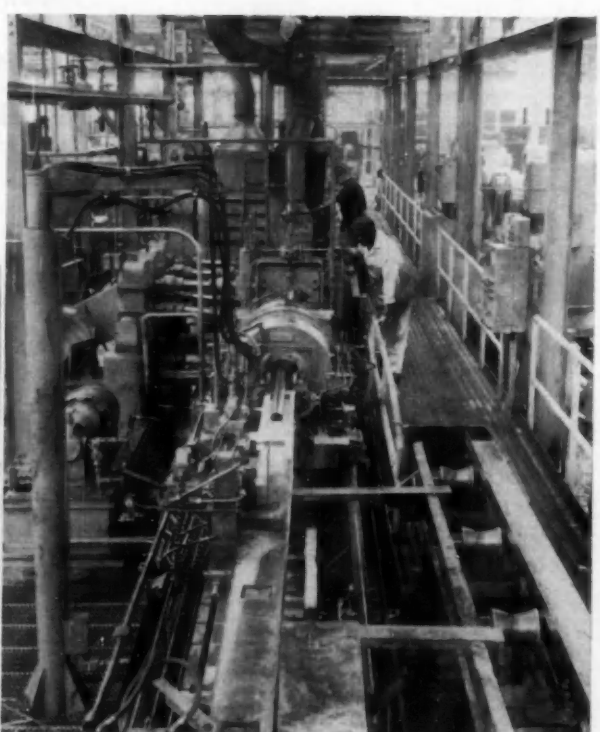
Supplementing the initial news release (see AI, May 15, 1957, page 36) this article highlights a number of unusual features related to product design and unique manufacturing methods. It may be noted that while this operation replaces the earlier Mound Road facility, the nature of the product as well as manufacturing techniques have been completely changed.

Let us look at some of the interesting features. For one thing the plant boasts what is considered to be the largest Gleason gear department to be found anywhere. It contains 700 new Gleason generators of various types for producing ring gears and drive pinions for rear axles. Moreover, all of this equipment is new.

For the production of drive pinions, Ford has installed six lines of fully automatic Fay lathes; each line consists of five Fay lathes linked by automation. These machines are a Ford "first." Rough forgings are fed to the first machine in the line and they are progressively milled, centered, and turned. Automatic loading is accomplished by means of pivoted arms with mechanical hands at their extremities. The work is removed from the work station and unloaded by



Among the novelties introduced by Ford is the turning of trunnions on the U-joint spiders in special transfer machines built by W. F. & John Barnes. Each of the transfer machines in this group is served by the Graphic Detecto Boards.



View of one gallery in the tube mill department showing a Yoder mill producing seam-welded tubing. Tubing is being produced at the rate of 105 ft per min in each machine of the type shown above.

the arm onto a shuttle-type pallet for transfer to the next operation.

At the end of the Fay line, the work emerges on a conveyor, transfers to an elevator, then feeds via an inclined conveyor section directly to a special Cincinnati angular head grinder for grinding the bearing sections. These grinders are fully automatic in operation, with automatic loading and unloading.

One of the features of the pinion line is a battery of Michigan Tool Roto-Flo machines for producing the spline at the end of the pinion. Similar equipment is used for splining axle shafts. All of these machines have a fully automatic cycle with automatic loading and unloading.

It is important to note that front spindles and axle shafts are inspected 100 per cent in new Magnaflux Magnaglo inspection machines. The operation is automatic; and it is well justified by the fact that Ford cars have been singularly free of failures in these highly stressed components.

Ring gears come in as steel forgings and are fed into New Britain chuckers for turning, facing, and boring. On large ring gears they use six-spindle machines; smaller gears are turned in eight-spindle machines. Following this the ring gears have the large bore broached in Detroit vertical broaching machines.

Drilling and tapping of holes is handled in special trunnion-type Barnesdril machines. They are equipped with a unique means of loading, consisting of pivoted arms. The first of these picks up gears from the feeder conveyor section and loads them into the first station.

Another special Barnesdril machine has been installed on the rear axle shaft line for facing the flange end and center drilling.

Perhaps the most dramatic change in manufacturing approach has been made in the method of making the rear axle housing. Discarding the techniques formerly employed at Mound Road, the housing now is produced in a number of small sections which are later welded into an integral housing. Essentially, the housing now consists of two small banjo sections (RH and LH halves), two tubes, two flanges, the cover, and the two spring pads.

Yoder tube mills turn out tubing at the rate of 105 fpm from each one. Later on, the tubing is slitted to standard length in Yoder slitters.

The heavy stamped parts such as banjo sections, upper and lower control arms, and rear axle flanges are produced in permanent setups in large transfer presses.

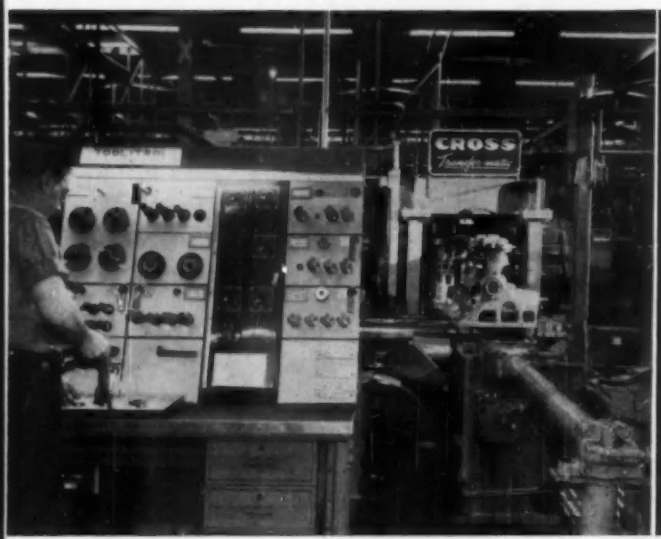
Altogether this department has some 10 transfer



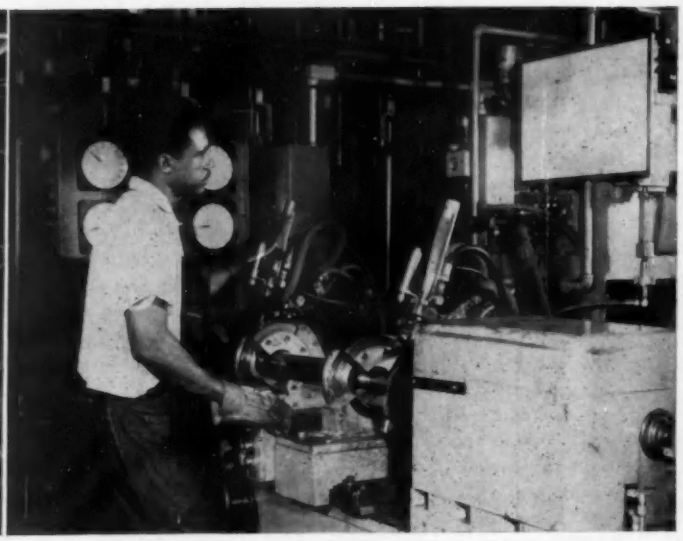
One example of the endless variety of Sheffield gages employed throughout the plant is this group at the end of the rear axle machining line. The operators are gaging the bearing diameter and oil seal diameters.



The rear axle assembly line at Sterling runs 320 ft in a straight line. This view shows the rear axle moving on the power-driven conveyor with differential carriers feeding the line from the overhead conveyor.



A group of five Cross transfer machines complete all operations on spindles, starting with a rough-turned bearing end. The Cross machine finish-turns the bearings, threads the end, and bores and drills all holes. To the right may be seen the pallets carrying spindles. In the foreground is



one of many tool boards, this one supplied by Scully-Jones. Illustration above shows one of the Gisholt balancing machines used for balancing drive shafts which are made of tubing produced in the Yoder mills and have a reduced section at the rear end.

presses supplied by Verson and Danly. Banjo halves are made in Verson 2200-ton capacity transfer presses, using six stations, producing at the rate of 18 pieces per minute. Rear axle housing flanges are made in 2000-ton Danly transfer presses. Front suspension upper and lower control arms are produced in 2200-ton Verson transfer presses at the rate of 1200 an hour.

An enormous welding department serves the axle housing operation. Each welder handles a part of the job: welding the banjo halves, then joining the tubes to the banjo, etc. With a few exceptions, all welding is done with the new CO_2 welding technique.

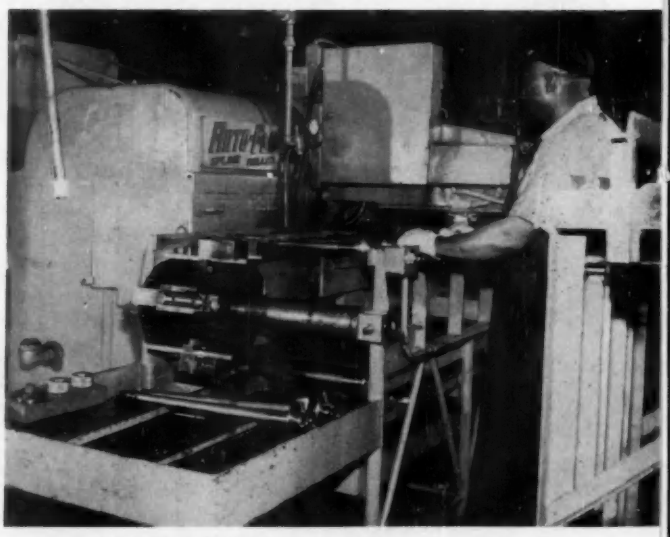
Another noteworthy production feature involves the drive shaft assemblies. This year the drive shaft has a reduced section at the rear axle end. Tubing for the drive shaft is made in Yoder mills, then transferred to Elmes presses for reducing the end in three stages in three presses.

Among the numerous Ford "firsts" is a battery of extensive W. F. & John Barnes transfer machines for hollow-milling the four trunnions of the U-joint spider. Each of these is served by the well-known Graphic Detecto Board installation which simplifies troubleshooting in case of electrical failure.

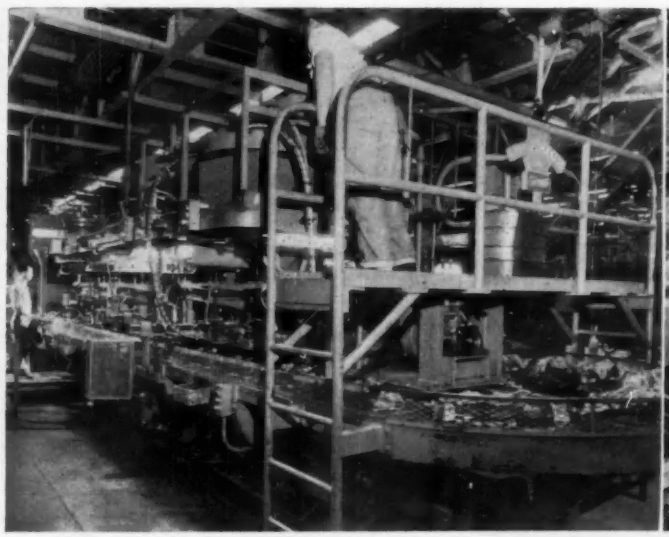
Welding yokes for the drive shaft are put through fast-operating Footburt continuous surface broaching machines. These units broach both sides of the two ears in one operation.

Another "first" is the development of special Cross transfer machines for completing all of the operations on front spindles, starting with a rough-turned piece. Five of these 18-station Cross machines are installed here, each one with 84 tools in operation. As illustrated, they are of pallet type with the conveyor circumscribing a square circuit around the machine. As usual the pallets go through a washer built into the conveyor line to clean them before reuse. Operations include finish-turning and threading, drilling and boring.

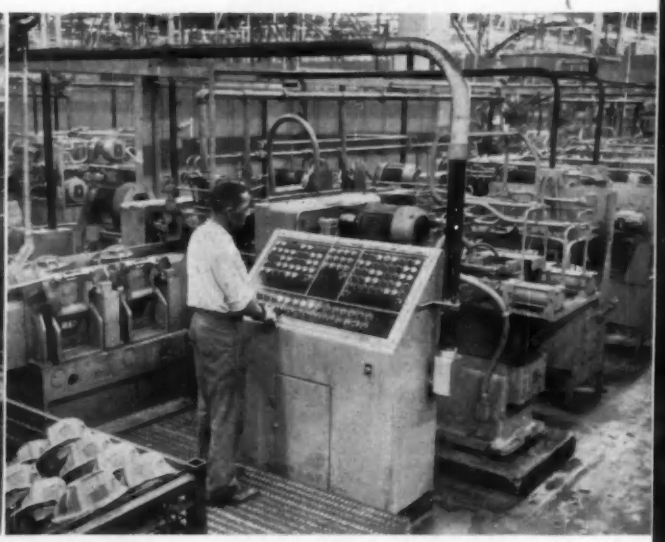
Rear axle carriers are machined in two stages in Greenlee transfer machines having 13 and eight stations respectively. One of the noteworthy features in this department is the hollow-milling of the 9-in. pilot



Large batteries of Michigan Tool Roto-Flo spline rolling machines are employed for rolling splines on pinion shafts and axle shafts. This view shows one of the machines on axle shafts. Loading and unloading are fully automatic.



One of the Gilman automatic assembly machines. Similar machines are used for the assembly of upper and lower control arms. Fully automatic in action, this unit has 38 automatic work stations, producing 640 assemblies an hour. Automatic inspection stations along the line serve to check at critical points.



Perspective of part of a 13-station Greenlee transfer machine for differential carriers. Four of these machines produce a total of 630 carriers an hour. Among the operations are: drilling and reaming 10 flange mounting holes, five retainer holes, four bearing holes; rough- and finish-boring the pinion bore; installation of bearing cap bolts.

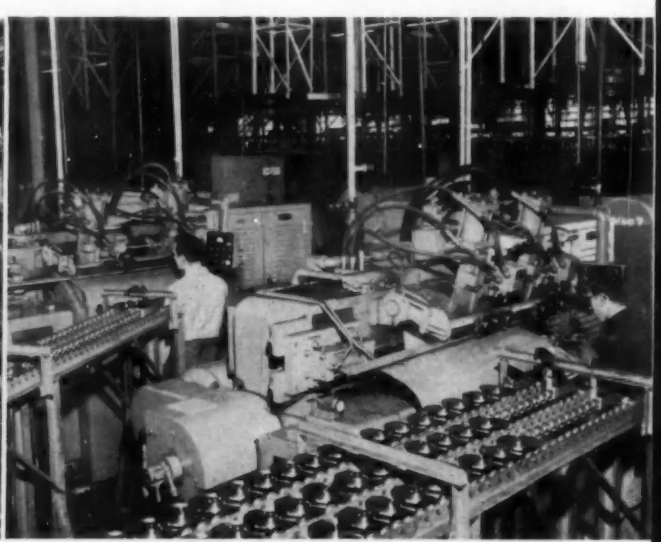
diameter. This is done in large, vertical two-spindle Ingersoll boring machines. Two-way Ex-Cell-O precision-boring machines bore the cross bores to finish dimensions and tolerances.

The rear axle assembly line, illustrated here, runs uninterruptedly for some 320 ft. Unhampered by space limitations, it was possible to subdivide operations to such an extent that there is none of the usual crowding of operators. One of the interesting features of the line is the Keller multiple nut runner which handles 10 fastenings simultaneously.

Ford management is particularly proud of the group of Gilman Indexomatic units which typify another "first." These are fully automatic assembly machines for producing upper and lower control arm assemblies. Each machine is in the form of a merry-go-round. It is good to report that these ingenious machines are in full operation.



Said to have the largest Gleason department anywhere, the Ford Sterling operation has a total of 700 Gleason generators of various types for cutting ring gears and pinions. All of this equipment is new — acquired for this plant.



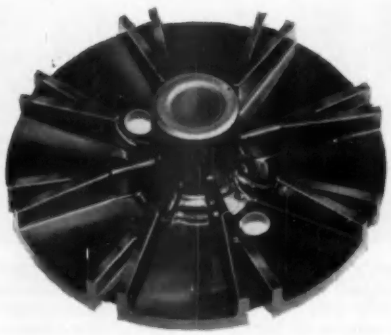
Reed-Prentice tracer-controlled lathes finish-turn the axle shaft spline diameter, bearing and oil seal diameters, flange face, and pilot diameter. Fourteen of these lathes are installed at this writing.

Water Pump Impellers Molded Automatically

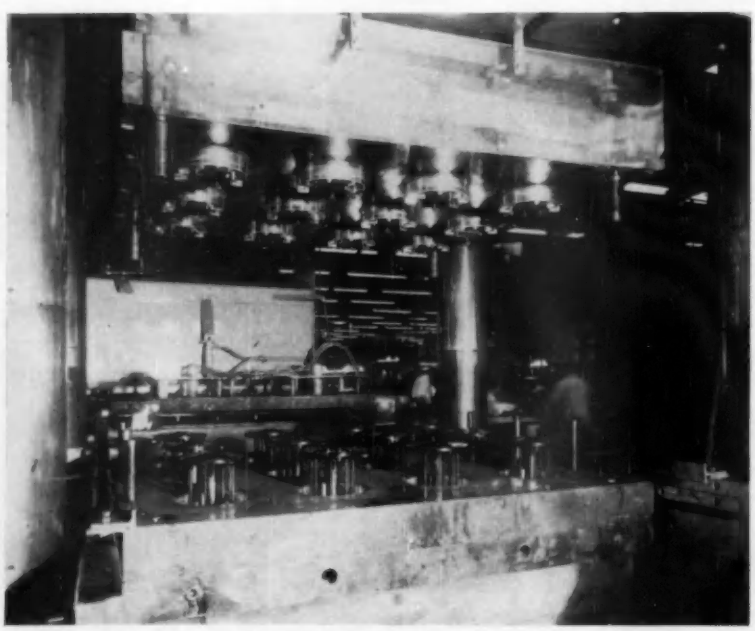
CONVERTING its engine water pump impeller from a metal casting to a phenolic molding, Ford Motor Co. has set up production facilities at its Ypsilanti plant for the molded impellers that include the largest fully automatic compression molding presses in use. The change from the iron casting to the molded plastics component has resulted in a weight saving, with attendant advantages, and in a direct cost saving as well. First step in the changeover was to a phenolic molding; automatic presses now increase production.

The molded pump impeller is 4¾ in. in diameter. As this new impeller is being used on the new Ford cars, the Mercurys, the Lincolns, the trucks and tractors, and for replacements also, high production is required. A battery of four presses, each using 12-cavity dies that produce a dozen impellers at each shot, comprise the installation.

In the molding of the impellers, the sequence of operations starts with the loading of inserts onto pins in each mold cavity. These inserts are the bushings through the hub of each impeller.



This illustration shows details of Ford's plastic water pump impeller



Close-up view of press with dies in raised position following molding of the impellers

The second step is the loading of the granular molding material into the mold, done by means of a loading board. The phenolic resin is preheated by a high-frequency dielectric preheater, and is then distributed to the mold cavities by the loading board, which moves in automatically, drops the charge of resin, and moves out again.

The actual molding then takes place. The press closes automatically, according to the cycle set up with the machine controls. The platen is next raised slightly, to "breathe" the mold by permitting escape of gases, and then closes again for the required cure period. Deceleration and slow breakaway are incorporated into this pressure stroke, also accomplished automatically by the machine controls.

At the end of the cure period the press opens, and knockout pins in the die raise the pieces. An automatic ejection device then moves in, carries the pieces out of the die, and drops them into a container.

The next operation in the automatic sequence is the cleaning of flash from the mold, in preparation for the next molding cycle. This is done with an air blast. The press then begins the next molding cycle.

In case of failure of the ejecting mechanism, a special safety device takes over automatically and stops the press. This operates through a limit switch, set at a point in the travel of the upper platen at which the press goes from low pressure to high pressure. If there is an obstacle in its path, the platen does not trip the limit switch and continue its travel, but instead stops the press. This prevents damage to the mold in case one or more of the impellers has not been ejected.

Another safety feature is the emergency button, which when pushed causes the platen to return to the top of its travel from any point in the cycle.

(*Turn to page* 112, *please*)

Special Setup at Dodge Truck Plant for Visualization of Equipment Location

By Joseph Geschelin

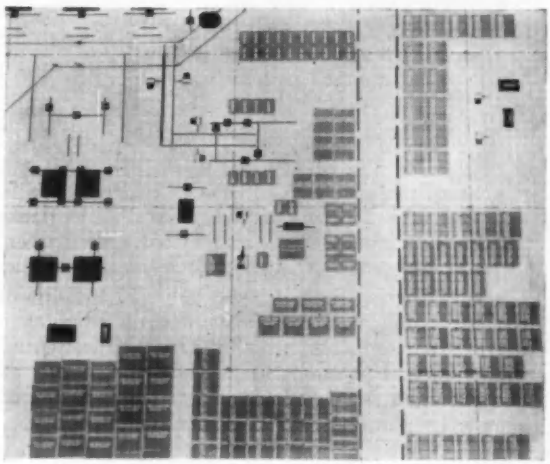
PLANT layouts have been the principal tool of the plant engineer in visualizing the placement of machinery and equipment, conveyors, electrical service centers, etc. Because of its importance to management, the techniques for developing such layouts have been evolving over the years. Starting with simple scale drawings, the art progressed to the use of paper and cardboard and plastic templates of equipment to effect greater flexibility. More recently, the art shifted to the preparation of three-dimensional layouts with faithful plastic reproductions of machine tools and equipment.

During the past eight months the plant engineering department of the Dodge Truck Division under the guidance of George Young, plant engineer, has developed an entirely new concept of floor plan visualization. The brain child of three engineers—Daniel Finlay, chief of plant layout, and John Heise and Harold Mater, plant layout engineers—it has attracted industry-wide attention and doubtless will be adopted by other plants.

The first step in this development was the design of special tables with cool-white fluorescent lighting located under the board. The table top is a piece of ¼-in. sand-blasted glass to provide for good diffused lighting.

The most important element of the planning board

(*Turn to page* 130, *please*)



Above is a closeup of a section of the new plant layout planning board used at Dodge Truck plant in Detroit



George Young (shown at far left in group), Dodge Truck plant engineer, uses the new plant layout planning board to discuss an assembly change with Murray Aitken (center), operating manager, and James Ross (right), plant manager. The planning board they are viewing is that of the 680 by 1260 foot main assembly building only.



Room-size engine test cells line both sides of the corridor shown here. Two operators can supervise test engines in the whole building wing with the aid of console-type panels.

Gulf's New Laboratory *for* Automotive Research

ONE of the world's most advanced laboratories for research into automotive fuels and lubricants is now in operation at Gulf Oil Corporation's Research Center at Harmarville, Pa.

A masonry and steel frame Automotive Building, covering 49,000 sq ft, a Fuel Blending Building of 2500 sq ft, a tank farm with 166,175-gal capacity, and a pipeline system, make up the new facilities. The entire complex is officially known as the R. B. Mellon Automotive Products Laboratory.

Heart of the elaborate installation—where the gasoline and motor oils of the future are being developed—lies in 20 room-size, engine test cells. Within these sound-proof, vibration-proof, specially ventilated rooms, a variety of engines are used to evaluate experimental products under severe test conditions.

An extra size cell—the 10,000 cu ft chassis dynamometer cold room—permits testing in full-scale vehicles up to transcontinental bus size.

Operators observe the tests through picture windows in corridors which flank the cells. They record and control engine functioning with the aid of console type panels so intricately instrumented that two men can supervise operations of a whole test wing. Once set up, tests may run 24 hours a day, seven days a week.

In open bays, six additional engines, of American Society for Testing Materials type, operate primarily on octane number studies.

Through metal grillwork, a "wall" of air is pumped from below, up and around the engine to carry off any fumes. Separate systems send the engine exhaust through the roof and supply filtered air under pressure for supercharging the engine. High and low pressure steam, fresh water and cooling pond water, and electricity at 440, 220 or 110 volts are individually supplied.

Each cell has its own dynamometer which permits operating the engine to simulate level road, up-hill, down-hill, or stop-and-go driving. Humidity and temperature of the air supplied to the engines can be varied to simulate different weather conditions.

Instruments control these supply systems as well as such operating variables as "weather," engine "loads," speed, temperature at critical engine points, oil pressure, generator charging rate and a score of other test factors. Fuel consumption is obtained automatically by an intricate "fuel weigher" of Gulf design.

(*Turn to page* 111, *please*)

Specially trained mechanics remove a radioactive piston ring from an engine at Gulf's new Automotive Products Laboratory. Tracers from radioactivated engines are used to investigate wear, corrosion, and product performance.



Reynolds Adds Facility for Large Aluminum Components

A NEW facility for the production of wings and other aluminum components of military and commercial aircraft has been added to the Reynolds Metals Plant at McCook, Ill., near Chicago.

The original Reynolds plant was built during World War II at a cost of $43 million. Enlarged and expanded since that time, the plant is now in a mile square tract, enclosing 36 buildings under a single roof and covering 60 acres. Of these, five are required to house the new installation.

In June, 1952, Reynolds was selected to develop production of roll tapered sheets in lengths and widths greater than anything existing at that time. This was accomplished with the erection of an 145-in. tapered rolling mill which is still the largest of its type.

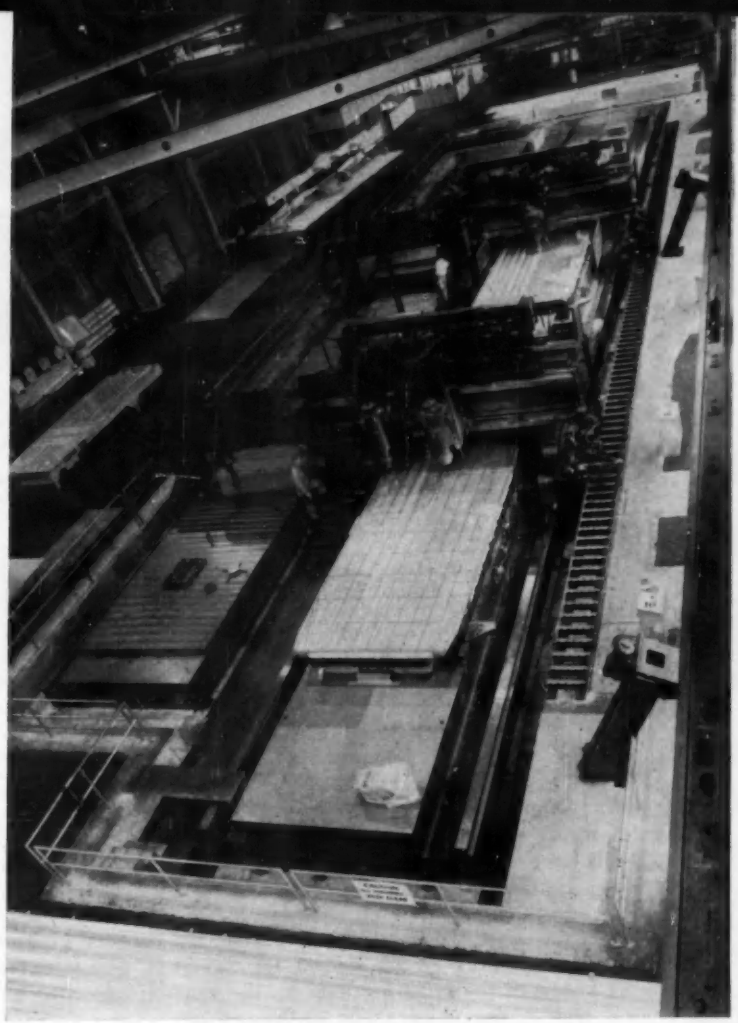
Military objectives were enlarged to include thicker plates and multi-dimensional sculptured surfaces. These requirements were met with the installation of twin fixed-bed gantry-type skin millers with a work bed over 100 ft in length.

To prepare stable surfaces for the sculptured component, the world's largest plate stretcher was developed. This huge machine can exert a pulling force of 16 million lb.

As each of these machines was added to the complex, it created lateral needs in improved tools and equipment. Dominant in this category is the industry's first horizontal-plate heat-treating furnace which handles plates too huge to be successfully treated in conventional vertical furnaces.

Not counting major expenditures for lengthening equipment to meet the demand for bigger and wider sheet and plate, other machines and equipment required for the new facility include: aging furnaces, heat treat furnaces, trimmer and shears, heavy gage

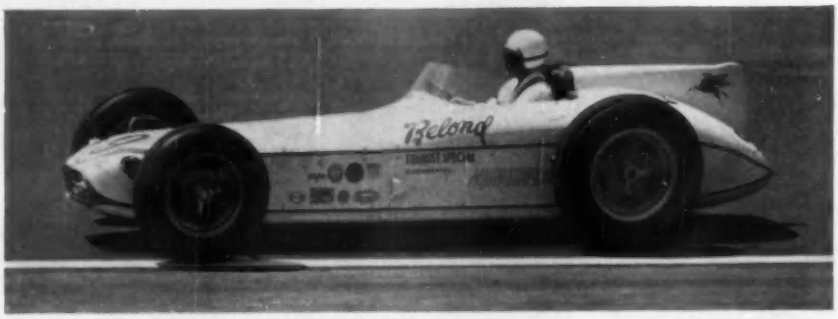
(*Turn to page* 154, *please*)



This skin mill sculptures intricate designs on huge wing structures. The twin skin millers provide almost limitless dimensions and contours, and eliminate the need for riveted skins.

This 145-in. taper mill can roll sheet or plate of uniform thickness or tapered dimensions. Like all major equipment at Reynolds' McCook plant, the mill is completely automated and integrated for continuous in-line production.





Sam Hanks in Beloni Exhaust Special, snapped in southwest turn while lapping at approximately 140 mph. Engine is inclined at 18 deg. from horizontal, permitting extremely low front body profile.

Still Faster Five Hundred

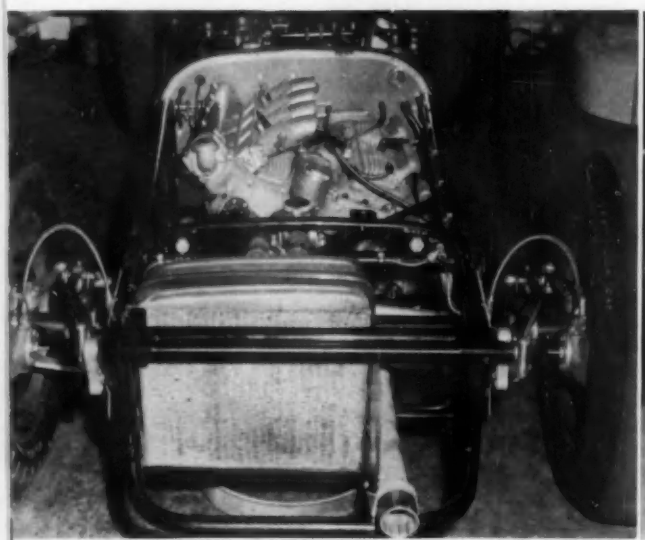
All photographs and complete text for this article produced exclusively for AUTOMOTIVE INDUSTRIES by Robert T. Jackson, Perfect Circle Corp.

SEASONED campaigner Sam Hanks, Pacific Palisades, Calif., sped to victory in the 41st annual 500-mile race at the amazing average of 135.601 mph! Hanks, veteran of 12 previous starts at Indianapolis, made three pit stops, all good ones.

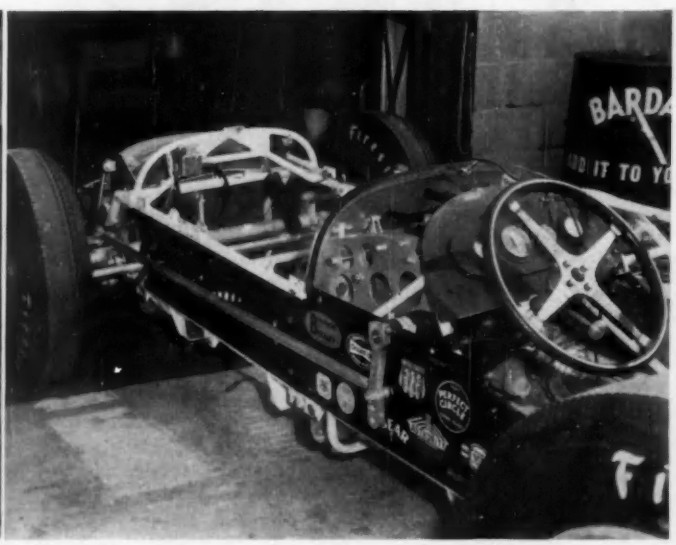
Hanks' acceptance of the checkered flag climaxed a contest of close-running rivalry seldom equalled in the lengthy annals of the 200-lap grind. As the scoring records had it, second-place Jim Rathmann ran within seconds of the fleeting Hanks throughout the latter half of the race and once he actually held the lead.

The early running was featured by tight dueling between Pat O'Connor and Troy Ruttman for a dozen laps or so. Shortly thereafter Paul Russo came up and grabbed the lead as Ruttman retired with engine trouble on his 14th lap. Russo and O'Connor then had

Front end details of Beloni Exhaust Special driven by Sam Hanks. Torsion bars (front one visible—taped) at top front corner of frame. Engine offset five inches to left and inclined at 18 deg. to horizontal cl.



Left side structural view of Bardahl Special (Kurtis-Kraft 500G), showing steering gear position, drag link, etc. Contrary to most of the so-called "roadster" type chassis, the two Bardahl entries driven by Al Keller and Jack Turner have the engine and drive line center set off five inches to the right. This places the driver on the left side of the drive shaft, accounting for the left hand steering linkage.



By
Robert T. Jackson
Perfect Circle Corp.

Cooperation of USAC Chief Steward Harry McQuinn; Steward Paul S. Johnson; and Chief Observer Walter Myers is gratefully acknowledged



Pace car finally braked down (at left), the starting field begins to string out through the first turn.

a brief tussle until Russo finally pulled away to run fairly well alone.

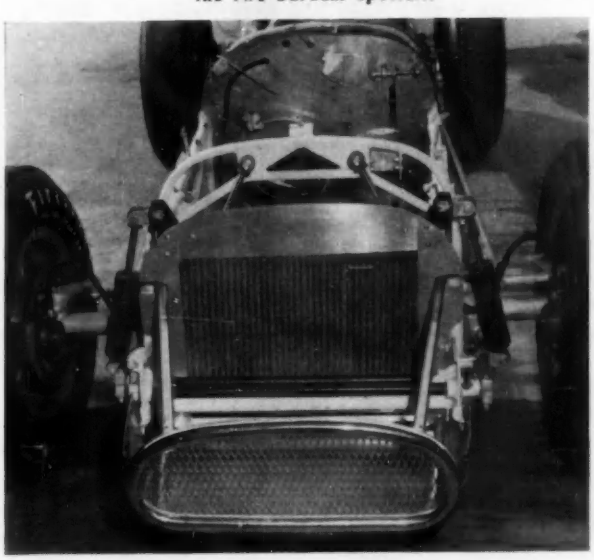
The 42-year-old Hanks, starting from inside position in the fifth row, had meanwhile slipped up through the field and establishd himself in second place after a display of strength in dueling with O'Connor. For several laps he craftily sized up the opportunities to challenge Russo and his growling Novi. On his 36th lap Sam made the bid. He *drove* past the Novi.

The real issue thus joined, Hanks went on to demonstrate his mastery of the situation, although Rathmann received lap prizes for leading approximately 24 laps—mainly as a result of the respective positions changing during pit stops. Hanks led throughout the last half of the event, even after making a final (third) pit stop on his 155th lap.

The Hanks win was undeniably one of the most popular ever recorded at the Speedway—both in the garages and the stands. In spite of the narrow margin separating him from the car which received second money, *Sam's triumph was obviously decisive and well-earned every mile of the distance.*

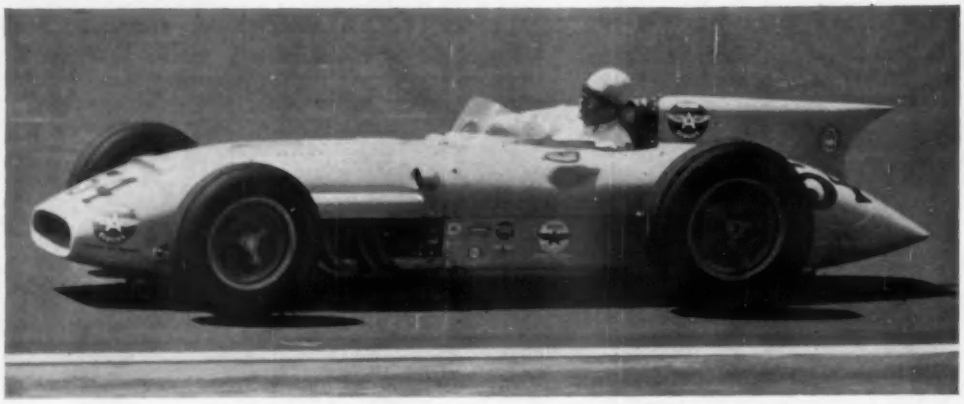
This reporter, seated in the press section as the

Front view of Kurtis-Kraft 500G. Taped torsion bars are visible at lower front end of frame. Attachment of dual piston type shock absorbers is partially shown. In 500G design torsion bar levers are beneath the front axle; radius arms are above or in line with it. This car is one of the two Bardahl Specials.



Hanks gets checkered flag for record-breaking victory.





Paul Russo hurtles through the southwest turn in his No. 54 Novi. He was an early front runner but fell back as the race wore on.

race reeled off 190 laps with Hanks running on a slim but comfortable lead, began to think what a pleasant task it would be to chronicle the story of victory for Sam. It should be easy also—what with so many things to write about.

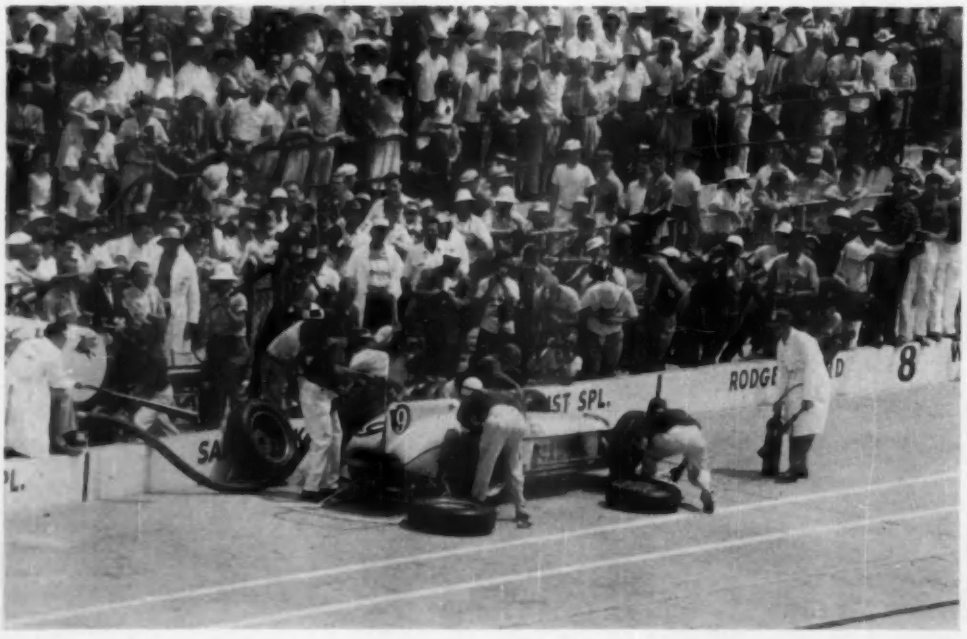
Now that it actually is being written, one suddenly discovers that it *isn't* easy to write. In fact, the real story contains only two words—SAM HANKS—and even the most polished writers are sometimes hard pressed to puff up a two-word narrative into something impressively saleable.

Of course there *are* other things to write about and we propose to cover them. But we inevitably return to the thought of a slick old pro in a slick new car writing into the hallowed records of the Hossier speed plant a performance so impressive and polished that it must obviously rank with those of the all-time greats.

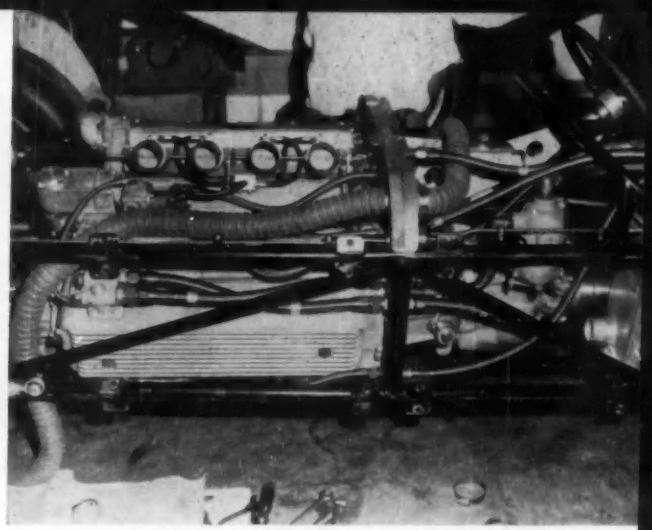
Integral with this performance, of course, is mention of the car itself—the Belond Exhaust Special—and its owner-builder-chief mechanic, George Salih. Salih built the chassis himself, the body panels, etc., were done by Quinn Epperly, and the engine came from Meyer-Drake.

The car bears the imprint of experience in all respects. Salih, among other things, groomed Hanks' second-place car last year and the winning car driven by Lee Wallard in 1951. He also is a full-time employee of Meyer-Drake Engineering Co., Los Angeles, which builds the engines formerly known as Offenhauser.

Point of principal interest in the Belond car is the position of the engine. It is mounted almost flat—at an angle of 18 deg from the horizontal—a placement which permits the front body profile to be kept very close to the ground. For what it may be worth,



Sam Hanks' final pit stop. This was a real sharp operation — he did not lose his slim lead.



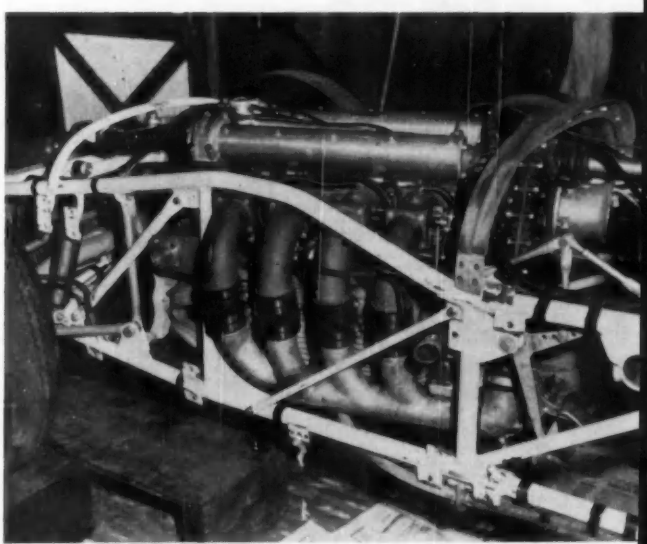
Bottom (left side) of engine in Sam Hanks' Belond Exhaust Special. Fuel injection unit at upper left.

this low, almost flat engine is said to run much cooler than one in the conventional attitude.

Apart from the lain-down engine, the Belond car displays quite a few details showing more than average ingenuity. Also, it is apparently of a rather satisfying lightness but not to the point of starvation, as it were. The weight angle, of course, is most important to the currnt trend of design at Indianapolis. In fact, one might say that the most dominant factor in car design for the Speedway has been reduction in overall weight. This trend, rather obviously, began in 1950 and may well persevere for quite a while yet —or until the rules might be changed to discourage it.

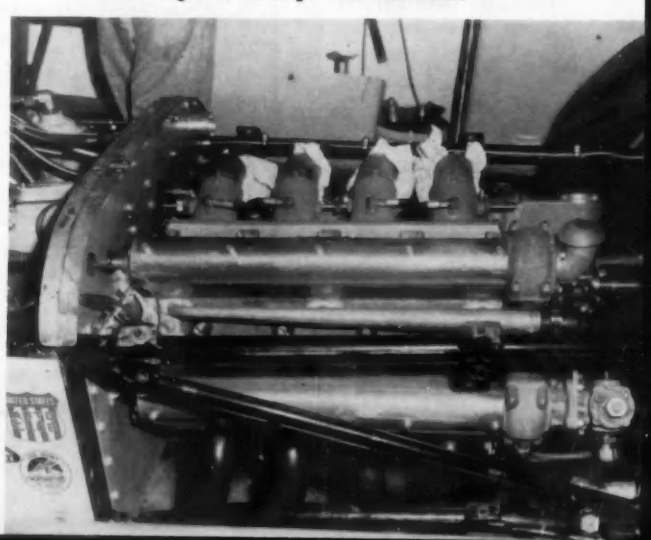
Frenchy Sirois and Howard Gilbert, two of the mechanics on Salih's staff for the Belond car, are also experienced men and carried out much of the actual pre-race preparation of the car. The car itself ran as faultlessly as it was driven. The pit work of this crew was outstanding, to say the least, and fully complemented Hanks' skill and talent on the course. To hack up an old racing expression, "everything was workin' real good" for these people and the result was their well-earned victory.

Elsewhere in the competition were numerous noteworthy situations. Easily a strong feature in the



Intake side of the Wolcott Spl. driven by Roger Ward. Showing fuel injectors and inlet delivery tube from the centrifugal supercharger. This car ran quite well until eliminated by mechanical trouble early in the race.

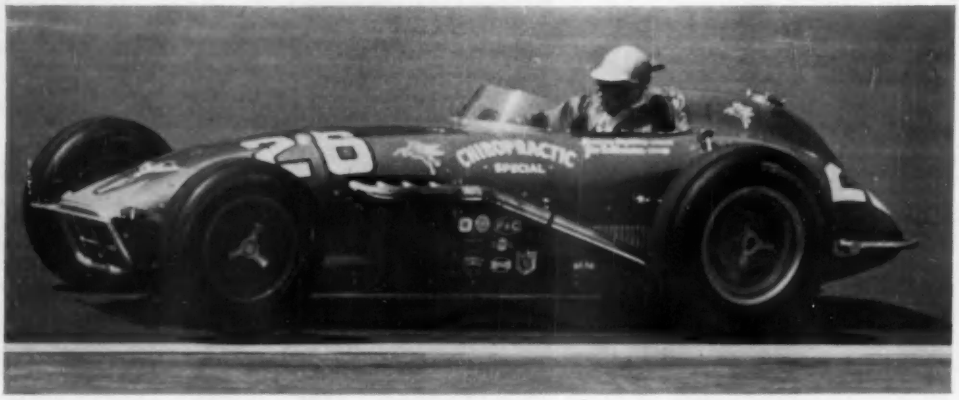
Top of engine in Sam Hanks' winning Belond Exhaust Spl. This is right side of car—engine is laid over to the right at an angle of 18 deg. from horizontal.



NEW RECORDS ESTABLISHED IN 1957 500 MILE RACE

(From Unofficial Sources)

Lap	Previous Record	Set By		1957 Record	Set By
1	138.867	J. Rathmann	(56)	.....	.....
4	140.724	Pat O'Connor	(56)	.....	.....
10	141.911	Pat O'Connor	(56)	.....	.....
20	142.255	Paul Russo	(56)	.....	.....
30	138.224	J. McGrath	(54)	140.003	Paul Russo
40	137.825	J. McGrath	(54)	140.023	Sam Hanks
50	136.212	B. Vukovich	(54)	139.058	Sam Hanks
100	133.726	B. Vukovich	(54)	135.296	Sam Hanks
110	133.818	B. Vukovich	(54)	136.242	J. Rathmann
120	132.104	B. Vukovich	(54)	134.358	J. Rathmann
130	131.940	J. Bryan	(54)	134.561	J. Rathmann
140	132.061	J. Bryan	(54)	134.968	Sam Hanks
150	131.383	B. Vukovich	(54)	135.332	Sam Hanks
And through 190		B. Vukovich	(54)	and most through 190	Sam Hanks
200	130.840	B. Vukovich	(54)	135.601	Sam Hanks



Jim Rathmann at speed. His strong "charge" into second place from a last row starting position was almost incredible.

early running was the drive of Paul Russo for the lead. Also the "pushing" of Freddie Agabashian, who ran second and third for many laps—at the tightest pace ever set on the Speedway. Jimmy Reece, to nominate the hard-luck candidate for the day, ran hard and well until his 182d lap — when he suffered the misfortune of a broken throttle (of all things) while running third at the time. Jimmy Bryan stayed well on the early pace and worked hard all the way. And there were others.

At one point, after the youth contingent, represented by Pat O'Connor and Troy Ruttmann, had faded or fallen, the first five in the standings were drivers who could only "look back"—to the age of 40! The pros sort of came into their own while the rookies didn't fare so well. Just the reverse of the 1956 results.

On the more prosaic side of things, perhaps the technical highlight of the race was the fact that the Novi cars, while they ran the distance and silenced critics of their durability, were unable (for whatever reason, if any) to stave off the competitive strength of their four-cylinder rivals. Paul

(*Turn to page* 160, *please*)

1957 Indianapolis Race Story
SUMMARY OF RESULTS

Car No.	Car Name (Spl.)	Driver	Qualifying Speed (mph)	Engine Size (cu. in.)	Laps Completed	Eliminated By (or No. of Pit Stops)	Place (& Av. Speed 1st Ten)
12	Sumar	Pat O'Conner	143.948	4-255.3	200	3	(8) 132.281
88	Peter Schmidt	Eddie Sachs	143.822	4-250.99	105	Broken valve	
52	John Zink	Troy Ruttman	142.772	4-251.88	13	Broken piston	
14	Bowes Seal Fast	Freddie Agabashian	142.557	4-251.61	107	Burst fuel tank	
6	Bowes Seal Fast	Johnny Boyd	142.102	4-251.61	200	3	(6) 132.846
5	Hoyt Machine	Jimmy Reece	142.006	4-255.3	182	Broken throttle	
53	McNamara	Ed Elisian	141.77	4-255.3	51	Broken cam gear	
16	Bardahl	Al Keller	141.398	4-25.61	75	Wrecked	
23	Travelon Trailer	Elmer George	140.729	4-252.23	0	Wrecked on start	
54	Novi Air Conditioning	Paul Russo	144 817	8S-168.89	200	3	(4) 133.818
10	D-A Lubricant	Johnny Thomson	143 529	4-250 99	199 F	4	(12) 129.871
73	McNamara-Veedol	Andy Linden	143.244	4-255 3	200	3	(5) 133.645
9	Belond Exhaust	Sam Hanks	142.812	4-250.99	200	3	(1) 135.601
22	Massaglia Hotels	Gene Hartley	141.217	4-251.61	200	3	(10) 131.345
1	Dean Van Lines	Jimmy Bryan	141.188	4-251.61	200	3	(3) 134.248
7	Bob Estes	Bob Veith	141 016	4-251.61	200	3	(9) 131.855
18	Sumar	Johnny Parsons	140 784	4-255 3	195 F	3	(16)
77	Dayton Steel Fdry.	Mike Magill	140.411	4-251.6	101	Wrecked	
19	Bardahl	Jack Turner	140.367	4-251.61	200	3	(11) 130.906
43	Chapman	Eddie Johnson	140.171	4-251 61	93	Front wheel bearing	
3	Ansted-Rotary	Don Freeland	139.649	4-251.61	192 F	5	(17)
27	Novi Air Conditioning	Tony Bettenhausen	142 439	8S-168.89	195 F	6	(15)
31	Seal Line	Bill Cheesbourg	141.565	4-250 99	81	Burst fuel tank	
8	Wolcott	Roger Ward	141.321	4S-165.48	27	Supercharger failure	
82	Central Excavating	Chuck Weyant	141 105	4-251.61	196 F	3	(14)
55	Sclavi-Amos	Eddie Russo	140 862	4-251.68	0	Wrecked on start	
92	MacKay	Don Edmonds	140 449	4-250.99	170	Spun out	
48	Sumar	Marshall Teague	140 329	4-255 3	200	3	(7) 132.745
57	Helse	Jimmy Daywalt	140 203	4-250.99	53	Wrecked	
89	Dunn Engineering	Al Herman	140 007	4-250.99	111	Wrecked	
28	Greenman-Casale	Johnny Tolan	139.884	4-251.61	138	Clutch failure	
26	Chiropractic	Jim Rathmann	139 806	4-254.13	200	3	(2) 135.382
98	Jones & Maley	Bob Christie	139.779	4-251.61	197 F	3	(13) 129.167

F = Flagged; running at finish (total of 17 running when winner finished).
S = Supercharged — centrifugal blower.
255 3 cu in. = 4 25 x 4.50
254.13 = 4 30 x 4 375
251 89 = 4 281 x 4 375
251.61 = 4 218 x 4.50
250.99 = 4.156 x 4.625
All four cylinder Meyer-Drake engines
S165.48 = 3 812 x 3 625
S168.89 = 3.20 x 2.625 Novi (Winfield) 8 cylinder engine.

1957 Indianapolis Race Story
Technical Data on Starting Cars

Car No.	Car Name (Spl.)	Driver	Chassis	Est. Dry Weight (lb.)	Oil	Magneto	Spark Plugs
12	Sumar	Pat O'Connor	KK-500G2	1700	Mobiloil	Cirello-Scintilla	Champion
88	Peter Schmidt	Eddie Sachs	Kuzma (57)	1700	Mobiloil	Joe Hunt	Champion
52	John Zink	Troy Ruttman	Watson (57)	1625	Veedol	Joe Hunt	Champion
14	Bowes Seal Fast	Freddie Agabashian	KK-500G2	1700	Mobiloil	Joe Hunt	Champion
6	Bowes Seal Fast	Johnny Boyd	KK-500G2	1700	Mobiloil	Joe Hunt	Champion
5	Hoyt Machine	Jimmy Reece	KK-500C	1900	Mobiloil	Joe Hunt	Champion
83	McNamara	Ed Elisian	KK-500C	1875	Mobiloil	Joe Hunt	Champion
16	Bardahl	Al Keller	KK-500G2	1700	Bardahl	Joe Hunt	Champion
23	Travelon Trailer	Elmer George	KK-500B	1960	Mobiloil	Joe Hunt	Champion
54	Novi Air Conditioning	Paul Russo	KK-500F	1875	Veedol	German Bosch	KLG
10	D-A Lubricant	Johnny Thomson	Kuzma (56)	1650	D-A Special	Joe Hunt	Champion
73	McNamara	Andy Linden	KK-500G2	1735	Veedol	Joe Hunt	Champion
9	Belond Exhaust	Sam Hanks	Salih-Epperly	1680	Mobiloil	Joe Hunt	Lodge
22	Massaglia Hotels	Gene Hartley	Lesovsky	1750	Mobiloil	Joe Hunt	Champion
1	Dean Van Lines	Jimmy Bryan	Kuzma (R57)	1700	Mobiloil	Joe Hunt	Champion
7	Bob Estes	Bob Veith	Phillips ('57)	1700	Mobiloil	Joe Hunt	Champion
18	Sumar	Johnnie Parsons	KK-500G2	1705	Mobiloil	Joe Hunt	Champion
77	Dayton Steel Foundry	Mike Magill	KK-500G	1760	Mobiloil	Joe Hunt	Champion
19	Bardahl	Jack Turner	KK-500G2	1700	Bardahl	Joe Hunt	Champion
43	Chapman	Eddie Johnsen	KK-500G2	1690	Mobiloil	Cirello-Scintilla	Champion
3	Ansted-Rotary	Don Freeland	KK-500C	1850	Mobiloil	Joe Hunt	Champion
27	Novi Air Conditioning	Tony Bettenhausen	KK-500F	1875	Veedol	German Bosch	KLG
31	Seal Line	Bill Cheesbourg	KK-500G2	1680	Mobiloil	Joe Hunt	Champion
8	Wolcott	Roger Ward	Lesovsky (57)	1670	Mobiloil	Scintilla	Champion
82	Central Excavating	Chuck Weyant	KK-500C	1860	Mobiloil	Joe Hunt	Champion
55	Sclavi-Amos	Eddie Russo	KK-500C	1900	Oilzum	Joe Hunt	Champion
92	MacKay	Don Edmonds	KK-500G2	1735	Mobiloil	Joe Hunt	Champion
48	Sumar	Marshall Teague	KK-500C	1850	Mobiloil	Joe Hunt	Champion
57	Helse	Jimmy Daywalt	KK-500C	1940	Mobiloil	Joe Hunt	Champion
89	Dunn Engineering	Al Herman	Dunn	1592	Mobiloil	Joe Hunt	Champion
28	Greenman-Casale	Johnny Tolan	Kuzma (57)	1629	Mobiloil	Joe Hunt	Champion
26	Chiropractic	Jim Rathmann	Epperly (57)	1600	Mobiloil	Cirello-Scintilla	Champion
95	Jones & Maley	Bob Christie	KK-500C	1870	Mobiloil	Joe Hunt	Champion

All cars used Perfect Circle Piston rings except the No. 22 Massaglia Hotels Special and the No. 48 Sumar Special which had Grant rings.

All cars rear drive. All four cylinder engines used Hilborn fuel injectors.

All engines used methanol base fuel.

All cars had magnesium wheels and spot brakes. Average wheelbase, 96". Average tread, 50-51". All cars were "roadster" type. All cars used 7.60x16 tires in front and 8.00x18 on rear. Tire pressure this year was 50 psi.

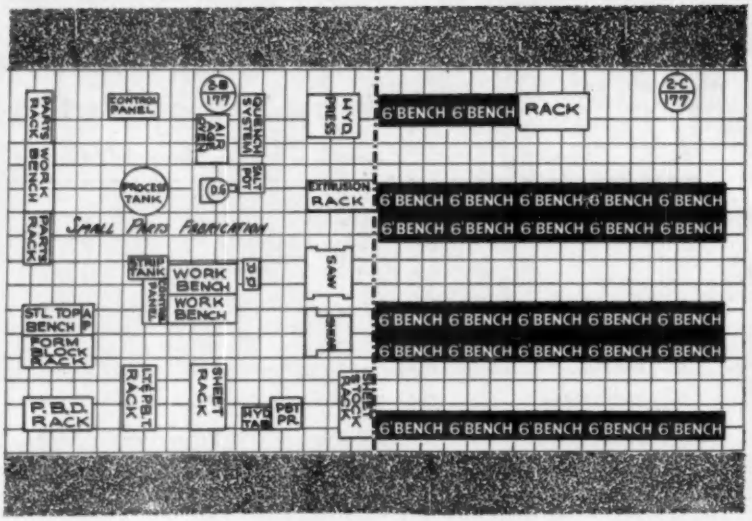
KK-500B (built in '53). KK-Kurtis-Kraft and KK-500C models (built in '54) have diagonal (crossed) torsion bars in front; transverse torsion bars at rear. Although differing slightly in some respects, the Novi (KK-500F) has same general arrangement. All other cars had transverse torsion bars front and rear.

KK-500G model built in '56. 500G2 built in '57. Both models have cradle-mounted welded aluminum fuel tanks.

The Kuzma-built Dean Van Lines Special was produced in 1955 but completely rebuilt in 1957 (see Kuzma R57). Is now much narrower.

Above data obtained through courtesy of the USAC Technical Committee, H. S. Dusenberg, Chairman; William Rodgers, Vice Chairman. Special acknowledgment is also directed to Vice Chairman Harry Hartz and members Max White and Al Hawkins for additional assistance. (Data recorded as of 5-29-'57.)

General arrangement of the small parts metal shop is shown in sketch at right



Small Parts Metal Shop in Aircraft Assembly Plant

Production Facilitated by Convenient Set-up at Assembly Area of the A4D Skyhawk

By Norman E. Heath
Superintendent, Model A4D Assembly
EL SEGUNDO DIV., DOUGLAS AIRCRAFT CO., INC.

SMALL metal parts are being manufactured with suitable equipment in the assembly area of the A4D Skyhawk far from Douglas El Segundo's regular metal fabrication shop.

This project, about two years old, affords closer coordination between development, design, planning and assembly. Its operation relieves premium equipment in the general metal shop of most of the small parts jobs. It eliminates all travel paper and holds all records during manufacture of the part. It permits development to design, manufacture and have the part ready for assembly in matter of minutes in an emergency and a great saving of time in the course of regular production.

A survey of parts produced for the airplane showed that a good break line could be drawn for parts of a size not greater than 12 in. by 12 in. This dimension became the basis for consideration in planning a line shop to handle such production at the point it would be used.

As this was to be a self-sufficient enterprise, all phases of sheet metal operation from storage of raw stock to completion of heat treated primed parts required consideration and the execution of the shop became the responsibility of Plant Engineering and Tooling.

The small parts metal shop, as it has been in operation in the A4D assembly area, is shown in the sketched layout. The area involved is 30 ft. by 36 ft. Operating equipment includes the following tools, storage areas and tooling:

Multiple racks for storage of shapes and flat blanked stock.

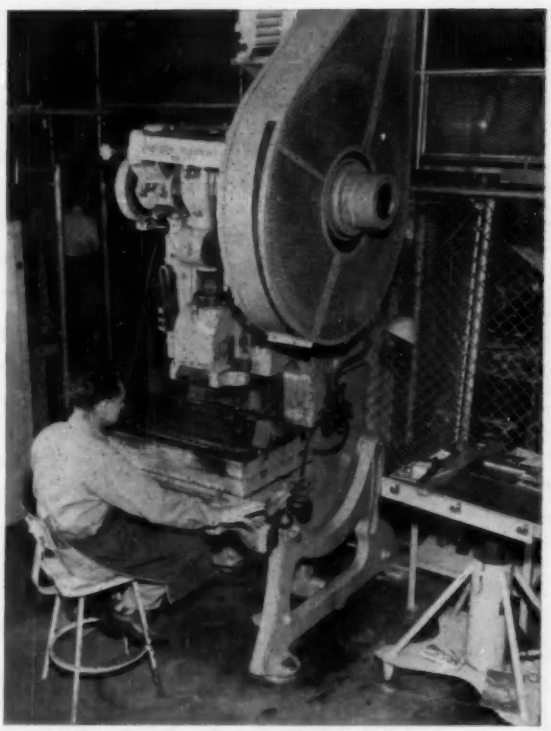
Multiple racks for storage of pierce, blank, templates and brake tooling.

Table metal saw.

Northhill square shear (18 in.)

Bliss press for blanking and piercing (21½)

(*Turn to page* 140, *please*)



Bliss press used for blanking and piercing



This scene, typical of Vickers conferences, shows some of the participants seated at the tables. The numbered cards indicate microphone locations at various stations.

Vickers Holds

Second Fabricating Machinery

Hydraulics Conference

An attendance of over 200 people, representing automotive plants, machinery and equipment builders, suppliers of accessories and hydraulic fluids, and Vickers specialists assured the success of the second Fabricating Machinery Hydraulic Conference sponsored by Vickers, Inc. Moderators for this conference were J. R. Hemeon, Trenton Ternstedt plant of GMC; and O. J. Maha, vice-president of Hannifin Corp. This meeting was held in Detroit last month.

A picture of the present and future development of the growing plastics industry was presented by W. T. Cruse, executive vice-president, The Society of the Plastics Industry. In 1956 the industry produced some 4-billion lb of plastics of all kinds. By 1975 it is expected to be producing at the rate of 8.8 billion lb. To effect this enormous increase in output, the plastics industry is looking to the development of entirely new kinds of molding equipment with characteristics not now in view. Faster molding cycles and advanced extrusion techniques are needed. The speaker visualized an impressive growth of automotive applications for cellular plastics; and some means of automatic molding of reinforced plastics for automotive uses.

As usual the conference covered a wide range of individual problems. Among these were: circuit and system problems; pump and valve design; petroleum and fire resistant fluids; maintenance; electro-hydraulic controls; seals and packings; fittings, tube, hose, etc.

In discussing pump cavitation it was the consensus that much of the trouble was due to clogging of filters with dirt and chips. The simplest solution, and one practiced by many plants, is to install good by-pass filters to assure a clean oil supply to the system.

Anticipating the usual interest in hydraulic fluids, Vickers released two bulletins of practical value to the users. Bulletin 1300A deals with the selection, operation, and maintenance of hydraulic fluids; Bulletin 57-73 covers the use of fire resistant fluids in machinery hydraulic systems. Both are available for distribution.

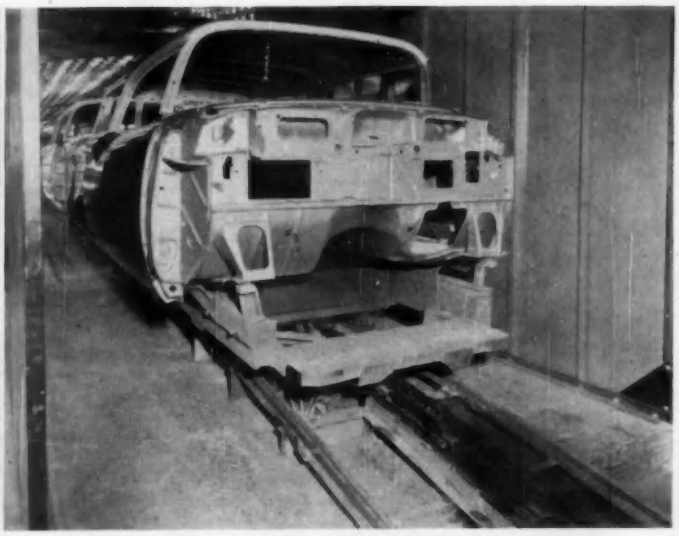
Several important papers were presented by specialists in their respective fields. H. Hansen, Taylor-Winfield Corp., described the hydraulic control employed on the many sizes of flash-butt-welding machines produced by his company. He noted that the high degree of versatility of hydraulic control provides the utmost in flexibility for any known flash welder application. Moreover, the rugged dependability of the control for repetitive functions is something that has been proved by many years of field experience.

A description of the application

(*Turn to page* 126, *please*)



View taken inside the Ransburg No. 2 type electrostatic spray booth. The arrangement of some of the spinning nozzles is seen clearly here.



Looking into one of the long Fostoria infra-red drying tunnels. These are used for drying lacquer finishes.

New Equipment at the Ionia Manufacturing Co.

By Joseph Geschelin

IN view of the changes in the automotive scene during the past several years, Ionia Manufacturing Co., division of the Mitchell-Bentley Corp., now has the distinction of being the largest independent autobody producer in the country. During the current model year Ionia is turning out station wagons for Buick, Oldsmobile, and Mercury, and expects to produce around 65,000 units.

The present operation is strikingly different from what it was in 1955 when the writer made his first visit to Ionia, Mich. (See AI, June 15, 1955). Then the division, which was building Buick Estate Wagons and Mercury station wagons, anticipated a volume of some 30,000 units for 1955. At that time the Ionia plant was also producing autobody trim for station wagons as well as for passenger cars. The Ionia and Owosso operations had a total employment of some 2800; today Ionia alone employs some 5000 people.

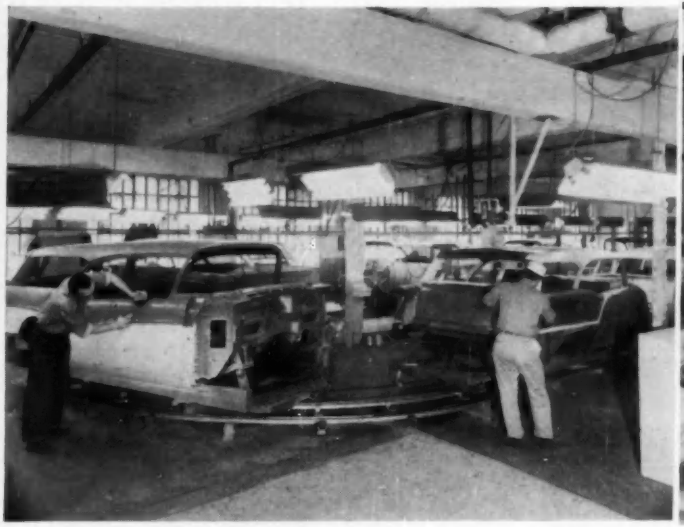
With an accelerated demand for station wagons in 1957 production, the company was projected into a radical shift in plant arrangement to accommodate the operation in the 1,550,000 sq ft of floor space available in the two buildings. Fortunately a handsome, modern plant had been completed in Owosso and the first move was to shift all trim and cut-and-sew operations to Owosso. The current station wagons was built up entirely from stampings supplied by the individual customers. That made it possible to dispense with the press shop required up to that time. Consequently, these shifts had the salutary effect of releasing some valuable floor space.

Even these moves would not have been productive were it not for the introduction of conveyorization throughout the plant. Ionia had conveyors before but it needed radical treatment. In cooperation with Jervis B. Webb, Ionia management developed a system of conveyors of every conceivable type, including floor conveyors, assembly conveyors, monorail systems, and several gate fixture merry-go-round monorail conveyors for side panel sub-assembly. One of the most important of these is a conveyor system for body dolly return which starts at the shipping dock, moves over to the main manufacturing building and threads the five floors of the latter.

At the present writing Ionia boasts about 3½ miles of conveyors of all kinds, a very impressive total for the amount of floor space they serve.

In addition to rearranging the plant, it was necessary to add some new drying ovens for baking the enamel finish on Mercury station wagons; and to add some new sections of Fostoria infra-red drying tunnels required for baking Buick and Oldsmobile lacquer finishes. Equipment for the Mercury paint shop required a new five-stage Bonderizing unit. Built by Bristol Industrial Equipment Co., the machine is about 140 ft in length.

The Mercury paint shop also needed a new spray booth for the first color coat, and a prime baking oven.



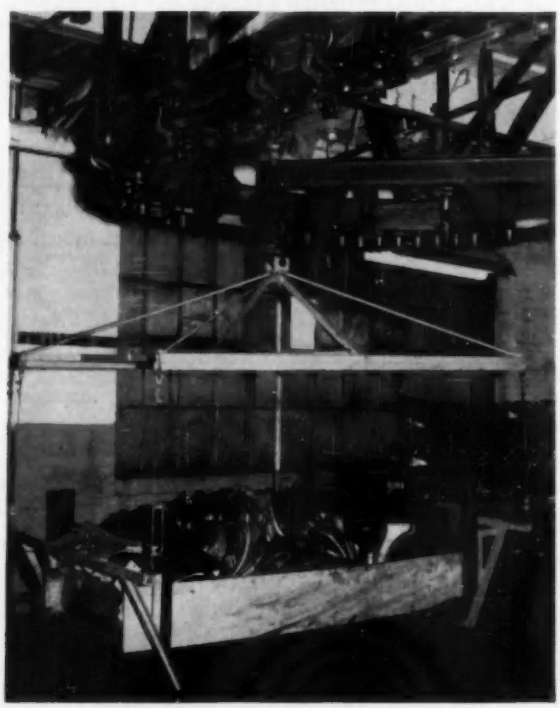
Buick and Oldsmobile bodies are seen moving on a chain-on-flat conveyor through the wet sand area. Just from infra-red drying, they are on way to finishing operations.



Buick and Olds bodies on floor conveyor moving through the high-gloss polish room.

The latter, about 72 ft in length, was designed to bridge the space between the two buildings, thus conserving additional floor space. Provision for lacquer drying had to be expanded too. Among other things Ionia has two new Fostoria infra-red tunnels:

A section of the parts conveyor which is equipped with specal carriers for transporting stampings from the loading dock to the various sub-assembly and assembly stations.



one is 120 ft long, the other 144 ft. In general the spray booths and gas-fired drying ovens were supplied by Newcomb-Detroit and Bristol.

With the addition of spray booths and drying ovens Ionia also installed two new fresh air supply systems; one has 120,000 cfm capacity, the other 90,000 cfm.

One of the noteworthy items of equipment in the paint shop is a Ransburg No. 2 type electrostatic spray booth for applying the prime coat on complete body assemblies. As illustrated, it has a battery of 10 disk sprayers, so arranged as to cover all areas of the body. Completely automatic in action, it requires no operator attention.

Incidentally, the full range of 79 colors required for the various options entailed the installation of an intricate mixing room, distributing the paints through a system of piping some 16 miles in length. The piping is so extensive that it has about 3000 gallons of material in circulation, excluding storage capacity.

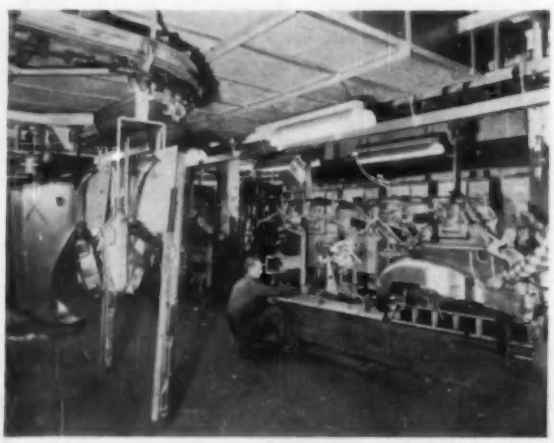
The enormous increase in station wagon demand made it mandatory to seek economies in many directions. For one thing, all stampings now are supplied by the customers. Moreover, they are shipped as individual stampings, in most instances, instead of sub-assemblies, which reduces freight cost.

At the same time the variety of body models and paint and trim options brought with it the problem of scheduling control associated with mass production operations. This has been solved by the introduction of a seven-station Telautograph system to control the process at critical points such as paint, trim, and final assembly.

It is reported that conveyorization included the installation of 21 different Jervis B. Webb systems, the objective being to tie the operations on five floors



An example of an overhead conveyor line with the tunneling for carrying it through a floor. This one is transporting finished doors as they come in from the customer.



Partial view of the power-and-free merry-go-round gate fixture conveyor on which the Buick and Oldsmobile side panel assemblies are prepared.

One section of the extensive dolly return conveyor system threading its way through a typical floor opening.



into the equivalent of a unified one-floor operation. Heart of the conveyor system is on the third floor where the two merry-go-round conveyors produce side panel assemblies for the three makes. This marks the central production control point since this is where the decision is made as to what specific body is to be scheduled into the system at any given time.

Illustrated here is one of the merry-go-round lines for producing side panel assemblies. This is of power-and-free design to facilitate the operation. However, both assembly lines are of gate-fixture type. The difference here is that the assembly is stripped from the gate fixture when ready for the body assembly line, instead of using the fixture as part of the framing jig as has been done in other instances.

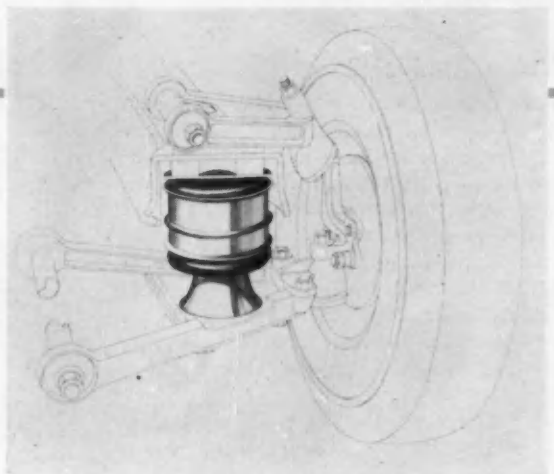
The power-and-free gate line that handles Buick and Oldsmobile side panels is provided with five pairs of fixtures, and has a developed length of 150 ft. The monorail merry-go-round is of conventional type for Mercury side panels, has three pairs of fixtures, and has a developed length of 100 ft.

Side panel assemblies for Buick and Oldsmobile are transported to the fourth floor on an overhead conveyor where they meet the other components for welding into the final body shell. The body shells for all makes and models are transported through all succeeding operations—from body-in-white, to the paint shop, and to the shipping bay in the other building while attached to floor type dollies. One of the major improvements in material handling is found in the dolly return conveyor system which takes the dollies from the shipping bay, as a body is unloaded, then transports them to the five story building. In the process, the conveyor traverses all five floors, dropping off Buick and Oldsmobile dollies on the fourth floor, then continuing to the fifth floor with Mercury dollies. This system alone runs some 1900 ft.

Another interesting conveyor system, illustrated here, is the sheet metal distribution conveyor which is equipped with 40 special carriers on 30-in. spacing. With a developed length of some 1200 ft, this system starts at the car siding where sheet metal parts are loaded onto the carriers. Then it threads the main building, terminating on the fourth floor. During this course, suitable stampings are picked off at the various welding and sub-assembly stations. It also serves to pick up sub-assemblies from the welding fixtures along the route for delivery to other assembly points as well as the final framing fixtures.

Included in the conveyor system is a group of 14 floor-type conveyors, several of which are illustrated. They travel at various speeds, depending upon the nature of the operation and with varying center-to-center spacing of bodies. The range of speed of these conveyors is from a minimum of 2.33 fpm to a top of 20.7 fpm. Despite these variations the transfer from one conveyor to another is accomplished automatically.

New Air Spring Developed by General Tire



Artist's concept of General Tire's air spring for passenger cars indicates position and general functioning of the unit. The new design is also adaptable to truck tractors, trailers, buses and other vehicles.

ANNOUNCEMENT of a versatile air spring for automobiles, trucks, and buses has been made by the General Tire & Rubber Co. The design involves a new configuration of rubber and metal parts in a more compact spring which requires much smaller air volume. It does away with the need for an auxiliary air compression chamber, utilizing instead only the spring volume.

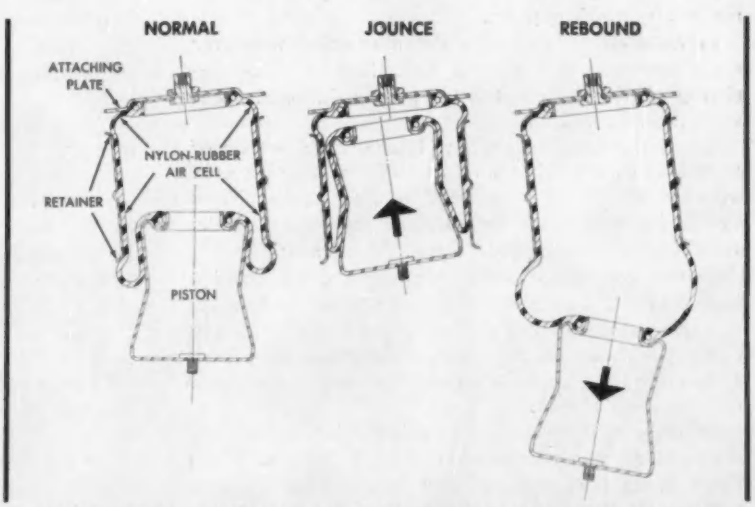
The new General Tire air spring is a band-diaphragm type unit—an air cell retained by a metal band to form a rolling diaphragm. As in all air springs, the load is supported by air pressure acting against the effective area permitting a constant car height regardless of the number of passengers.

Spring rate from full jounce to full rebound can be tailored to fit the curve designed by the suspension engineer. A very soft ride is developed at normal suspension position by designing that portion of the curve to have a low spring rate. The rate is increased as the suspension goes into jounce or rebound to prevent strike-through and excessive roll. The rate increases very rapidly toward the end of the jounce stroke so that the size of the jounce bumper can be reduced to a minimum.

The floating girdle band on General's spring accommodates suspension geometry without disturbing the action of the spring. This makes it possible for the suspension designer to use a simple suspension configuration with a minimum of parts or to incorporate the spring in existing suspensions without major frame and body changes.

General Tire's truck air spring which preceded this development differs from the new design in that it is an elongated bellows type which cannot be designed to control the effective area in such a manner that an exceptionally low spring rate results. It provides a considerably lower rate on trailers than has been provided for in the past by steel springs. However, the spring rates that are considered low for trailers and trucks are entirely too high for passenger cars and, therefore, this type spring does not apply.

The new spring, which does have the very low rates desired for passenger cars, has also been designed to give suitable rates for trailers, trucks, buses and other heavy equipment.



Cross-sectional view of the new, low-rate air spring shows the normal, jounce, and rebound positions.

The Application and Results of Value Analysis

By LOUIS M. KOLB, VALUE ANALYSIS SPECIALIST
Aircraft Gas Turbine Div.
General Electric Co.

What is Value Analysis?

VALUE analysis may go under several aliases, such as value engineering, dollar engineering, or purchase analysis, but basically defined: Value analysis is a science used for the discovery and removal of unnecessary costs from a product without affecting its quality, function, or sales appeal.

As a science, it makes use of a group of specific techniques which have proved very effective on a wide range of products throughout the General Electric Co. Among these techniques are the tests of value, the value analysis job plan, and the key value analysis techniques.

"The tests of value," listed below, are applied to all products to determine if there is an absence of value. Every part, material, process, or operation that goes into a product must answer these questions: does its use contribute value?; is its cost proportionate to its usefulness?; does it need all of its features?; is there anything better for the intended use?; can a usable quality part be made by a lower cost method?; can a standard product be found which will provide the same function?; is it produced on proper tooling—considering the quantities?; do materials, reasonable labor, overhead and profit make up its total cost?; will another dependable supplier produce it for less?; and is anyone else buying it for less?

An area of poor value exists if these questions cannot be answered properly.

In value analysis terms, poor value exists whenever more than the lowest possible price is paid for a function or service delivered at the proper time and place, with the required quality.

The value analysis job plan is the basic method or technique of attacking a value problem after an area of poor value is determined. There are seven phases to this job plan which are normally carried out in the following chronological sequence. These are:

Evaluation Phase—Get all the pertinent facts which include costs, quantities, vendors, drawings, and manufacturing methods. Develop a thorough understanding of the problem with the engineer by asking questions. Determine the amount of effort that must be expended on each item of cost.

Speculative Phase—Use creative thinking to generate every possible solution to the problem. Write down every idea that seems remotely possible. Systematically explore various processes, materials, parts rearrangement and other possible solutions.

Analytical Phase—Carefully evaluate each idea, eliminating only those that seem definitely impractical. Thoroughly investigate all promising ideas for possible savings. Set up a systematic program to pursue the most promising idea.

Vendor Contact Phase—Contact the responsible buyer and conduct a search for the best suppliers. Provide the selected suppliers with sufficient facts to enable them to make suggestions.

Engineering Study Phase—Make a second contact with the responsible engineer, bringing him up to date on all progress. Get any additional ideas he may have.

Engineering and Vendor Study Phase — Evaluate each supplier's proposal with the responsible buyer and select the best supplier. Bring the supplier and the engineer together to discuss proposals and get an agreement on a program to finalize the collection of ideas. If sample parts and testing are required, process a Purchase Order Requisition to buy the required number of samples.

Status Summary and Conclusion—Issue a concise and complete summary of the project. Distribute copies to the men affected and to responsible management for final action.

It should be noted that throughout this program, or job plan, no authority has been affected. In each phase, the responsible personnel have made the necessary decisions to carry out the recommendation to its completion. Upon establishment of the advantages of the recommendation, responsible management must still take the final step to incorporate it into the product.

The last group of techniques called "The key value analysis techniques" are not only the tools of the value analyst, but they embody the very philosophy of value analysis. The successful value analysis program must be able to execute these techniques as a part of its day to day operations. Some of the more important techniques are: get all the facts; get all your information from the best sources; work on specifics and not generalities; evaluate designs by comparison; evaluate the functions of every part; use specialty products and materials; use specialty processes; use creative thinking; remove all obstacles to new ideas; put a dollar sign on each main idea; use standard parts and materials; use the services your Company offers; use your own judgement; and use good human relations.

For consistently favorable results, all the various techniques and methods itemized above, along with others, must be welded into a definite pattern of opera-

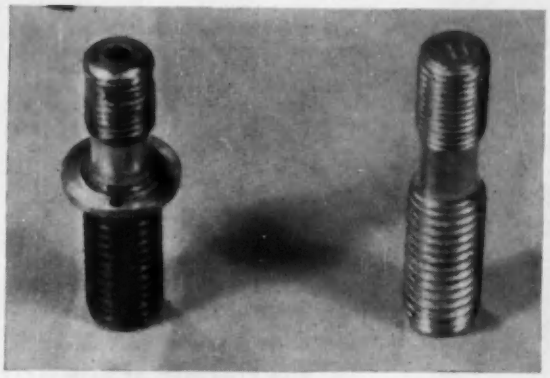


Fig. 1—Specially machined stud is shown at left; self-locking stud at right

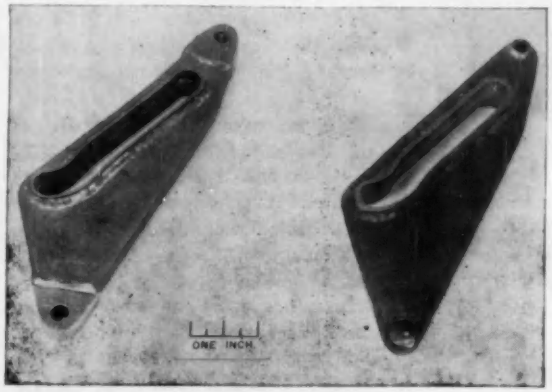


Fig. 2—Ejector nozzle as originally designed (left) and improved design (right)

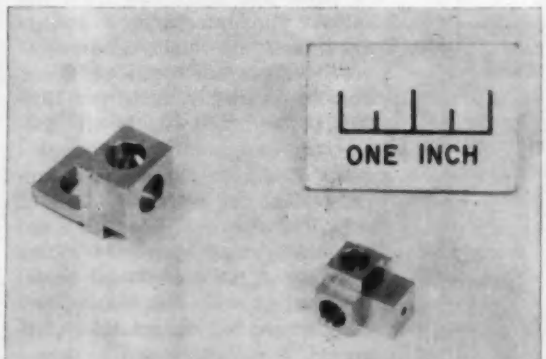


Fig. 3—Lube nozzle fittings

tion best suited to the individual plant and product.

These techniques and methods were developed by L. D. Miles, who began the General Electric Company's value analysis program in 1947. The first project was conducted on a control device and saved 30 cents a unit. Although this saving is small in itself, the control device had an annual production rate of one million units, and the project netted a tidy $300,000. With this kind of success as a background the General Electric value analysis program has grown quickly, and today 45 departments of G.E. and its subsidiaries have operating value analysis units.

Why Have Value Analysis?

The need for value analysis stems from the fact that areas of poor value can and generally do exist in any product. This is as true of the most stable standard products as it is of constantly changing new products.

The existence of poor value in a product which is being successfully marketed does not have to result from disinterested or inefficient personnel and management nor from improper methods and controls. Poor value is most often a result of patterns and habits of thought, the limitations of personnel, and difficulties in the dissemination and acceptance of new ideas. Today's thinking is generally based on yesterday's knowledge.

There are advantages of attacking these areas of poor value through value analysis. Value analysis is removed from the operating pressures of Engineering, Manufacturing or Purchasing and can supply a fresh and original approach to a problem. This new approach is a basic part of the value analysis training. Value analysis can cross departmental lines easily and gather a more complete picture of a problem. Value analysis is a full-time job of reducing cost and not an occasional committee get-together. The specialized training of a value analyst makes him the most capable instrument of cost reduction available.

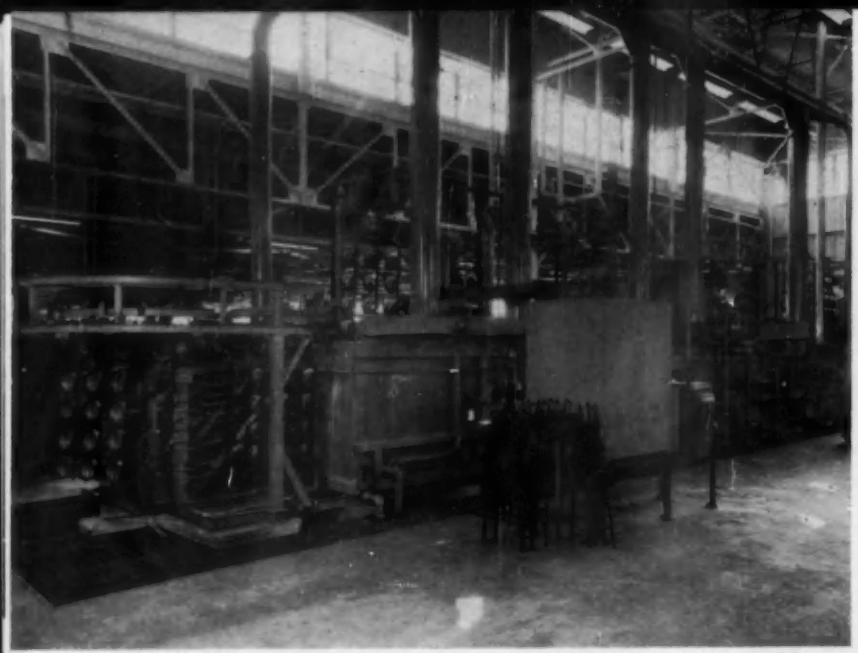
THE PRODUCTION ENGINE DEPARTMENT'S VALUE ANALYSIS PROGRAM

There is a value analysis unit in each of the two sections which comprise the Production Engine Department of the Aircraft Gas Turbine Division at Evendale, Ohio. These two units have a total of 14 men, who perform similar functions for the section of the Department in which they are organized. The unit in the Assembly and Spare Parts Section consists of nine men, and the Components Manufacturing and Engine Rebuild Section has a unit consisting of five men. Both units are organized under a Materials Sub-Section.

The value analysis unit of the Assembly and Spare Parts Section, to which this article will be confined, is the largest operating value analysis group in the Company and reports to the manager of the Materials Sub-Section. It is responsible for the application of value analysis to all the components of any engines in current production, all spare parts which are under contract, and all IME (indirect materials expense) items used within the section. Value analysis training of the section personnel is also the responsibility of the unit.

Value analysis is not a substitute for the excellent cost reduction program carried on by the Production

(*Turn to page* 114, *please*)



Perspective of the large Warner Bros. zinc plating machine. Fully automatic in function, the only manual labor required is that of loading and unloading the racks. The cycle takes about 23 minutes and about 1100 parts are plated per hour.

Power Brakes and Control Equipment for Wide Variety of Vehicles Produced at Self-Contained Facility

New Owosso Plant of Midland Steel Products Co.



Looking into the press shop. The 450-ton Clearing press is at the right; the large Bliss press at the left. Each one is at the head of a line of smaller presses that complete the operations on each stamping

IN its recent program of decentralization of facilities, Midland Steel Products Co. has created its Owosso Division for producing power brake and control equipment for passenger cars, trucks and buses. This self-contained operation is housed in a distinctive new plant in Owosso, Mich., providing nearly 200,000 sq ft of productive floor space on one floor. Close to 4000 ft of monorail conveyors expedite the smooth flow of parts and materials from the various manufacturing departments to the assembly lines.

Products of this important parts-making division range from Midland power brake kits to air compressors and a variety of control valves and accessories.. The company has a complete line of actuating devices for air and vacuum braking systems for cars and trucks; air controls for buses, tractors, shovels and cranes, and other types of industrial equipment.

The plant has been departmentalized to handle the variety of component parts most effectively. To this end there is a self- contained press shop; machine shop; welding bay; and metal cleaning and plating department. Finished component parts then flow directly to the many individual assembly lines where the various assemblies are produced.

A system of statistical quality control, using sampling methods, has been developed to control quality at every stage. While this



View in screw machine department showing the installation of the first three Greenlee, six-spindle automatic screw machines. Three more Greenlees are due for delivery shortly.

is employed in the manufacture of component parts, it is interesting to add that finished assemblies are subjected to 100 per cent inspection and testing to assure conformity with specifications.

Apart from maintaining the quality of machining operations, one of the major concerns is in the corrosion resistance of components, particularly those directly exposed to the atmosphere. To provide this protection, all external ferrous parts such as the shells of brake cylinders, covers, slave cylinders, and other parts are processed through an impressive Wagner Bros. zinc plating machine, illustrated here. Completely automatic in operation, the only manual handling it requires is the loading and unloading of parts on the standard racks. At the present time this unit is plating about 1100 pieces an hour.

In addition to machine plating, individual aluminum parts are given the familiar Alodine cold dip treatment, while zinc die castings are treated with a hot dip Zinodine.

All of this chemical treatment is essential to assure long life since exposure to the atmosphere and road corrosion constitutes the major hazard for equipment of this kind.

A central inspection department serves as the watchdog of quality in checking initial setups for the various machining operations. In addition, it handles the sampling inspection of parts in production in accordance with the statistical quality control system. One of the noteworthy devices found here is the Brush surface indicator which is employed for checking surface finish. For example, the slave cylinder—the heart of the brake control system—has a large and a small bore both of which are held to extremely fine surface finish specifications after burnishing to size. The Brush analyzer is employed in checking the initial setup; then it is used for inspecting specified samples during the course of the day.

A corner of the press shop is illustrated here. It consists of two parallel lines of presses—one for deep drawn shells at the right, the other for shallow draws at the left. Deep drawing is handled in the Clearing press in the foreground, while operations for the other line start with the Bliss press at the left. A massive Niagara square shear, with a capacity of ⅜-in. mild steel, is used for shearing plate and strip.

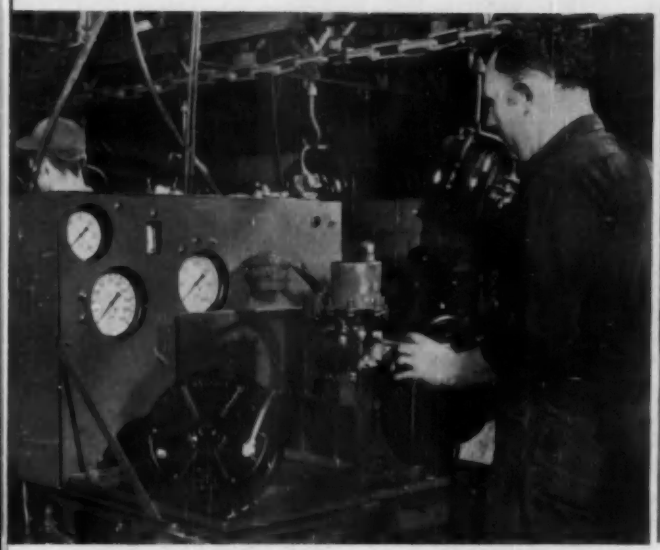
Due to the large variety of parts produced here, the metal cutting equipment is of conventional character, consisting mostly of general purpose machines. At the time this was written they were installing a battery of the latest type Greenlee, six-spindle automatic screw machines. The initial group of three units is illustrated here. Three more are due soon. When these are in operation Midland will have one of the most advanced screw machine departments to be found in the industry.

The welding department features a row of resistance welding machines, including two large multiple projection welders such as the one illustrated. The entire group is controlled precisely and automatically by means of a battery of Robotron control cabinets mounted overhead. This permits versatility of control settings for the many different kinds of welds required in production.

Illustrated is a typical final test fixture on one of the Hy-Power brake units. This one takes the unit through five test cycles in 1½



One of the two large multiple-projection welding machines. This one, rated 800 kva, is seen welding the reinforcement in the front cover of of the Hy-Power assembly.



This is one of a bank of test stands for testing assembled Hy-Power units. Designed to simulate actual operating conditions, they take each assembly through five test cycles in 1½ minutes, this being a 100 per cent plant procedure.



Perspective in shipping department, showing part of the 4000-ft system of monorail conveyors. These also expedite the smooth flow of parts and materials from the various manufacturing departments to the assembly lines.

minutes. A 100 per cent procedure, it is duplicated for all power units produced in the plant.

Extremely close tolerances are required for many components and in the assembly of power units. For example, the cylinder bores for air compressors are finish-honed to a tolerance of 0.0005 in. The piston pin fit in the piston at assembly is held to a tolerance of plus or minus 0.0001 in. Surface finish of the burnished bores in slave cylinders is held to 12 mu, rms.

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Army Tank Contract Won Officially by Chrysler

Chrysler Corp. has been awarded a $119 million contract to make 900 M48-A2 medium tanks. The Army had previously approved the contract, but it had to be cleared through the office of the Secretary of Defense (see AI, June 1, p. 33).

Army officials said $89 million will go for construction of tank bodies in the Delaware facility. The remaining $30 million will be spent for production of tank engines and other parts in a plant at Muskegon, Mich. The decision to have most of the work done in Delaware reportedly will result in a saving of $1.878 million.

Scant Funds Seen in Prospect For New Army, Navy Vehicles

Skimpy funds for new official Army and Navy cars are in prospect for the 12-month period beginning July 1.

Congress shows it is reluctant to believe these two services need 6,652 new sedans, station wagons, and ambulances in the new fiscal year. This reluctance is heightened by an Air Force request for money to buy only 62 such vehicles. The result may be a sharp cutdown in vehicle funds.

Passenger vehicles wanted by the Defense Dept. and its components in the year ahead are as follows: Office of the Secretary of Defense, 5; Dept. of the Army, 4,191; Dept. of the Navy, 2,461; and Dept. of the Air Force, 62; the total is 6,719.

New Fuel Injection Device Is Developed by Russians

A truck fitted with a novel fuel injection device has reportedly undergone tests at the Institute of Physical Chemistry of the USSR Academy of Sciences. The device is said to consist of a combustion chamber in which the fuel mixture is ignited with the aid of normal spark plugs.

The ignited mixture is injected into the cylinders, in the form of narrow flames, through small apertures. Savings of up to 20 per cent in fuel consumption purportedly have been recorded, as well as a reduction in the quantity of carbon monoxide emitted. The new fuel device is to be produced in Gorki, and test production runs are being made at the Likhachev Works in Moscow.

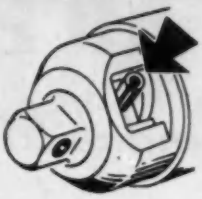
AMC to Shorten Nash, Hudson; Smaller Second Rambler Is Due

American Motors Corp. apparently is extending its Rambler precepts of smallness and compactness across the board next year. Although AMC will definitely come out with what it describes as a "senior line" of cars, the 1958 versions are expected to be considerably smaller than current models.

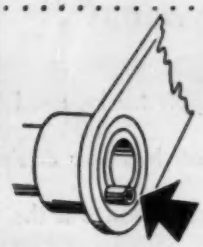
Plans are said to be afoot to build the 1958 Nash and Hudson on a 112-in. wheelbase chassis, more than nine in. shorter than that used on current models. Thus, the 1958 versions will be actually only four in. longer in wheelbase than the current Rambler.

In addition to the regular Rambler, built on a 108-in. wheelbase, AMC is also expected to bring out a smaller 100-in. wheelbase model, similar to the one it offered in 1955. The smaller Rambler is to take the place of a four-passenger Metropolitan, which was planned originally but cancelled because of tooling costs. Powered by a 100-hp L-head engine, the second Rambler should carry a price tag of about $1750.

Rollpin® replaces 12 different fasteners



REPLACING A GROOVED PIN . . . in this application, Rollpin serves as a stop pin in a ratchet wrench adaptor. With its light weight and high shear strength, Rollpin functions perfectly . . . cuts assembly costs.



REPLACING A KEY . . . Rollpin demonstrates its ability to do away with precision tolerances, in this heating system damper arm. Faster, cheaper and more satisfactory than previous assemblies.



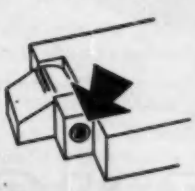
REPLACING A RIVET SHAFT . . . Rollpin serves as an axle for the sparkwheel of a cigarette lighter. No riveting or threading necessary . . . faster assembly. Note flush, clean fit.



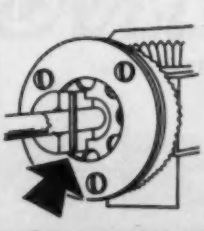
REPLACING A COTTER PIN . . . Rollpin assembly time is shorter, service life ten times longer. Vibration-proof flush fit. Easily removable.



REPLACING A SET SCREW . . . to fasten automobile brake handle a short length Rollpin is self-retained in the hand grip but can easily be driven into over-drilled hole in shaft for simple handle removal.



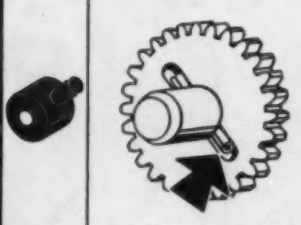
REPLACING A CLEVIS PIN . . . here Rollpin holds firmly in clevis, permits free action of moving member. Rollpin application shown is the plate of a home workshop tool.



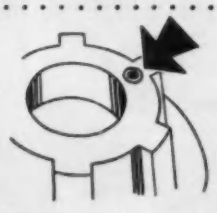
REPLACING TAPER PINS . . . in the assembly of precision differentials eliminated cost of taper pin reamers and the entire reaming operation. Rollpin costs less than a taper pin and installation is cheaper. They remove easily.



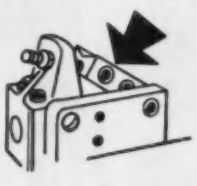
REPLACING A HEADED PIN . . . in this hinge pin application, Rollpin is simply and inexpensively driven in place, greatly reducing assembly costs. Constant spring tension holds Rollpin firmly in place . . . eliminates loosening of hinge due to wear.



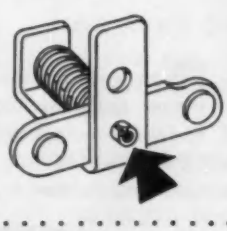
REPLACING A HUB ON A GEAR . . . Rollpin, self-retained in shaft, is simply snapped into molded slot to position sintered gear. This application, by an office equipment manufacturer, effects major savings in assembly. Rollpin's high shear strength is particularly valuable here.



REPLACING A DOWEL PIN . . . Rollpin is used here to prevent rotation of a thrust bearing. No reaming, no special locking. Easily removed. Lowest possible dowel pin cost.



REPLACING A BOLT AND NUT . . . Rollpins act as fasteners and pivots for the linkages in this electric welder. Rollpins may be used with a free fit in outer or inner members depending upon product design requirements.



REPLACING A RIVET . . . Rollpin serves as guide shaft for spring-loaded electrical interlock contacts. This electrical equipment manufacturer reports that rivet failure previously occurred at the clinched end under normal operating impact and vibration.

WHERE CAN YOU USE THIS SIMPLE FASTENER?



Rollpin is the slotted tubular steel pin with chamfered ends that is cutting production and maintenance costs in every class of industry.

Drives easily into standard holes, compressing as driven. Spring action locks it in place—regardless of impact loading, stress reversals or severe vibration. Rollpin is readily removable and can be re-used in the same hole. Made in carbon steel, stainless steel and beryllium copper. Write for samples and information, ELASTIC STOP NUT CORPORATION OF AMERICA, 2330 Vauxhall Road, Dept. R47-65, Union, New Jersey.

ROLLPIN TRADEMARK

ELASTIC STOP NUT CORPORATION OF AMERICA

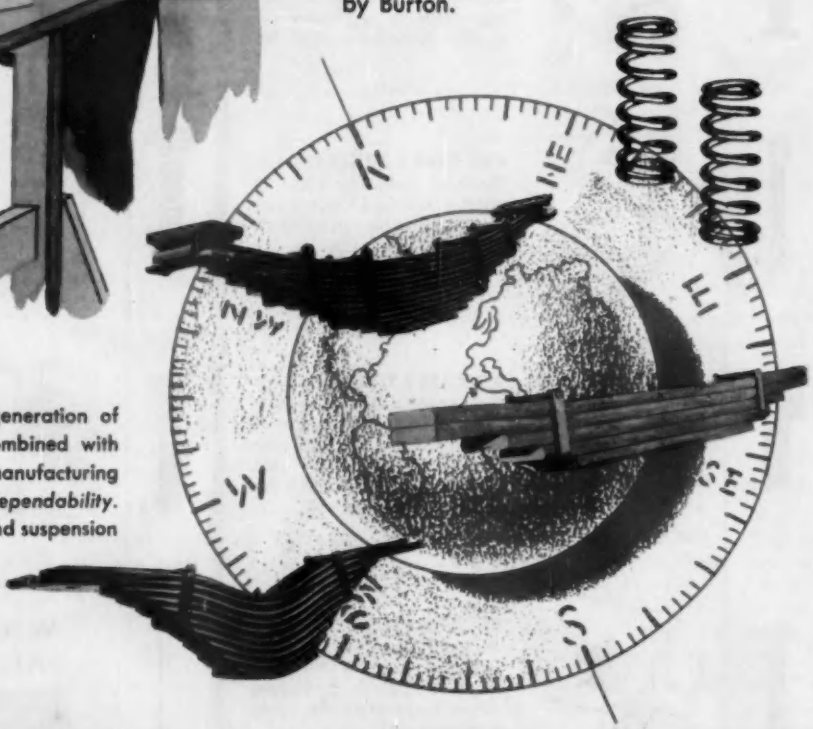
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WOOSTER



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- **improved deliveries** from increased manufacturing facilities devoted exclusively to *industrial hydraulic equipment*.
- **better service** through close personal attention to customer requirements will be a Wooster operating policy.
- **advanced designs**—the result of extensive research facilities and development programs—will be a Wooster forte, in the Pesco tradition.

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Welding Fasteners and Weldnuts—Provide trouble-free assembly of fabricated metal parts... Use National welding fasteners when primary fasteners must be cleanly welded into exact position. National's complete line of projection welding screws and nuts is available in stock sizes, for optimum welds in materials .030 to ¼" thick. We will develop special designs for you.



Spin-Lock® Fasteners—Give you strength at low cost, with self-locking, ratchet-tooth action... Spin-Lock machine and tapping screws have angled teeth to permit fast, easy tightening. They require about 20% greater torque to loosen. Available in pan, truss, flat and hex heads; slotted or Phillips recessed heads; No. 4 to ⅜" diameters, lengths from twice diameter and up.



Flex-Head® Locking Screws—Self-locking, highly resistant to fatigue, shock, impact... Tight locking results from flexing of the head and axial spring tension produced when fully torqued against a rigid seat. Flex-Head screws are identical in dimension, and interchangeable with standard machine screws. Made of 1022 steel and heat-treated for top strength.



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Tuff-Tite® Cushioned Fasteners—Seal openings, eliminate vibration noises, absorb shock... Pre-assembled neoprene washers also prevent finish marring! Available as tapping screws, thread cutting screws, machine screws, roofing bolts, stove bolts, or wood screws; with Phillips or slotted heads; pan, round, truss or hex head styles.



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Place® Bolts—Self-locking...resist impact, shock and fatigue failure by controlled spring action of reinforced, diaphragm head... Place bolts resist involuntary loosening when rigidly seated. Typical uses: connecting rod bolts, main bearing cap screws, flywheel bolts. Available in high carbon or alloy steel, in a wide range of sizes.

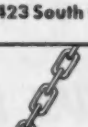
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SPEEDS UP DRILLING 25%

Pennsylvania Drilling Company, Pittsburgh, manufactures drilling equipment for foundation testing, mineral prospecting and other drilling, boring and sampling operations. Recently they introduced a new Flush-Joint Drive Casing made from cold drawn OSTUCO Seamless Steel Tubing.

The new casing stepped up overall drilling progress 25%—driving and pulling is easier and quicker. Flush-Joint Casings are stronger, too—actually 50% less breakage . . . with resultant savings in downtime, repair and material costs. Success with the new casing led to its incorporation in Penndrill's newly-designed Testborer which augers, automatically samples and drives and core drills.

There's a good chance OSTUCO Tubing components can improve the performance of your product. You can start the process by contacting the nearest Ohio Seamless sales office, or by writing direct to the Shelby factory.



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News of the MACHINERY INDUSTRIES

By Thomas Mac New

The ASTE Research Fund To Sponsor a Basic Metal Cutting Research Program. Overall Development Is Expected to Require at Least Five Years.

ASTE Reveals Research Program

"Every year, more than 15 million tons of metal are whittled away into chips at a cost of more than 10 billions of dollars!" This statement was made at a press conference in Detroit sponsored by the Research Fund of the American Society of Tool Engineers.

Hans Ernst, director of research, The Cincinnati Milling Machine Co., and a member of the ASTE Research Fund Metal Cutting Steering Committee, followed the above statement with additional data demonstrating the economic importance of metal cutting research to U. S. industry. If improvement in machining methods through research should save only 10 per cent of this cost it would add more than a billion dollars to our economy.

Dr. W. W. Gilbert, manager machinability development, General Electric Co., and also a member of ASTE Research Fund's Metal Cutting Steering Committee, advised that G.E.'s scientific approach to solving metal cutting problems has resulted in substantial increases in production. By using presently available metal cutting knowledge, it has been possible to double the rate of metal cutting in most cases, and to increase it as much as 10 times in several operations.

Col. L. S. Fletcher, ASTE Research Fund Director, said, "Industry's need for more and better information in metal cutting was readily apparent, and met with such enthusiastic response that the ASTE Research Fund decided to sponsor basic metal cutting research."

An essential requirement was that the enormous project would be attacked step-by-step. The overall program is expected to require a minimum of five years to complete.

W. S. Budington, Associate Librarian, Research Information Service, The John Crerar Library, presented a progress report on the initial development to be completed in the Fall of 1957. This consists of the compilation of a Metal Cutting Bibliography with specially prepared abstracts of all available information from 1943 to date. The Crerar Bibliography for ASTE begins where the last previously published bibliography ceased in 1943.

The second stage is an evaluation of all metal cutting literature —a task assigned to the Battelle Memorial Institute. Dr. F. W. Boulger, Chief of the Institute's Division of Ferrous Metallurgy, submitted a list of tentative conclusions in his progress report. Following a discussion with outstanding research workers and practical engineers in the metal cutting field, final conclusions will be incorporated in a report carefully outlining all theories of metal cutting which Battelle's study has shown to be tenable. Areas in which further research is needed will be indicated. This second stage will be completed in the spring of 1958.

The third stage was announced for the first time at the Press Conference; the ASTE Research Fund advised that it will seek ways and means of establishing standardized machinability test procedures. With the establishment of unified standards in machinability tests, industry would stand to save millions in dollars and hours. The present situation has been compared to the position of two men attempting to measure the size of a room, when neither of them agreed on the length of an inch.

Commenting on the overall ASTE Metal Cutting Research program Col. L. S. Fletcher, Research Director, said, "The ASTE Research Fund recognizes that it is embarking on a long term, broad, research program. It also realizes that such a program can be successful only if industry accepts the major share of the burden. We are hopeful that industry, which has such a high stake in the results, will enthusiastically accept the leadership of the ASTE Research Fund and provide the required assistance.

ASTE RESEARCH FUND'S PROJECTS

Temperature Distribution in the Workpiece
Fog Method of Applying Cutting Fluids
Metal Cutting
The Properties of Metal Borides
Plastic Tooling
Metal Stamping

Electron Drill

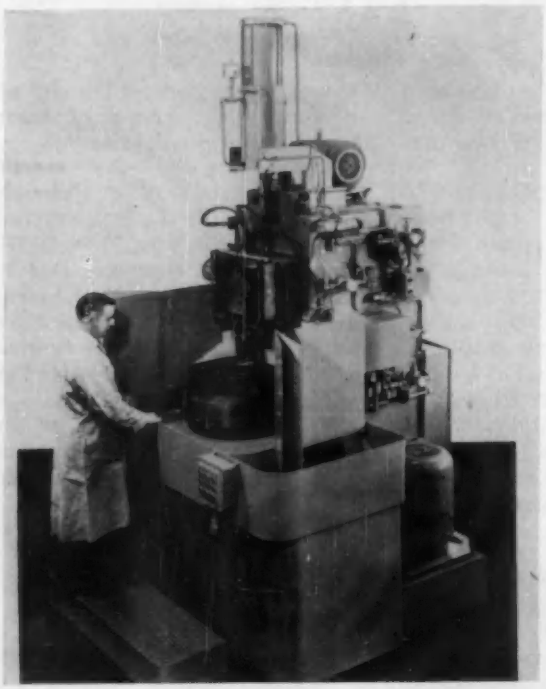
A new drill, which is claimed to pierce steel, stone, and diamonds by using a high velocity stream of electrons, has been patented in this country by a German inventor. The drill uses a tubular "gun" with an electron-omitting material such as tungsten. A beam of electrons from the battery-powered gun is focused with the aid of an electromagnet at the object to be drilled. An extremely fine hole, 1/250 in. or smaller, can be drilled with the device to about a fifth of an inch deep.

Inventor of the new drill is Heinz Steigerwald. His patent was assigned to Carl Zeiss of Heidenheim, Wuerttemberg, Germany.

(*Turn to page* 154, *please*)

NEW PRODUCTION and PLANT EQUIPMENT

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 89



Hoern & Dilts series BL-1 single - station machine, designed for a variety of rough and/or precision finishing operations, utilizes a standardized cam-actuated head developed for multi-station machines to provide single automatic cycles of operation. It is available in single or double spindle models. Options also include single, multiple or variable spindle speed drives; motor drives from 3 to 20 hp per spindle; and high lift slides for loading of extra large pieces.

Single-Station Precision Finishing Machines

KNOWN as the BL-1 series, a new line of single-station precision finishing machines has been built to perform the following operations: contour turning, boring and facing; straight boring; surface grinding; surface honing; ID and OD grinding; contour milling; and horizontal or straight milling. Designed for work requiring rough and/or precision finishing operations, they utilize standardized cam-actuated heads developed for the company's multi-station finishing machines. The application of these interchangeable heads to a single-station machine makes available single, completely automatic cycles of operation heretofore available on the multi-station high-production machines.

The BL-1 series is obtainable in single or double spindle models, and with single, multiple or variable spindle speed drives. Motor drives from 3 to 20 hp per spindle are available. Cross slide travel is five inches; longitudinal slide travel is six inches.

Other stated features include: rapid slide traverse during idle; vertical spindles for easy loading and accurate seating of parts in chuck; and optional high lift slides for loading of extra large pieces. *Hoern & Dilts Div., The New Britain Machine Co.*

Circle 30 on postcard for more data

Nozzle Compound

TO prevent splatter pick-up on welding nozzles, a compound has been introduced that is said to be effective for as long as eight hours after each application. Called Linde 65 Sigma Nozzle Compound, it is applied to the nozzle before welding and forms a thin protective coating over the bore and mouth. This coating keeps molten splatter from sticking to the nozzle surfaces, thus eliminating the time normally required for cleaning. The material is greaseless, odorless and non-toxic. It is supplied in a four-ounce can with spout, ready to use, and may be applied directly to the nozzle without special preparation. *Linde Co.*

Circle 31 on postcard for more data

Adjustable Bed Presses

EXTENSIVELY modernized and redesigned, the latest version of a line of adjustable bed presses is now available, according to a recent announcement. The new trim, compact design is said to incorporate a number of specialized controls and devices, neatly recessed in the sidewalls or completely housed behind flush panel doors, for increased output.

There are no overhanging or protruding components. Operator's panel, auxiliary power supply, flywheel brake operating lever, and safety block are recessed into the right side of the press. On the opposite side a panel door flush with the surface conceals the automatic oil lubricating system. Housed in the back of the press are the air control panel and combination motor - press control panel. Overall space-saving compactness is reported to result. *Niagara Machine & Tool Co.*

Circle 32 on postcard for more data



Niagara redesigned adjustable-bed press

Pore Structure Gage

For testing the pore structure of various materials, a new instrument has been developed called the Porosimeter. It measures the sizes of pores in materials with pores ranging from 0.1 mm to 0.06 microns, and determines pore volumes as small as 0.0005 milliliters at each pore diameter. Illustrative of its application is in determining the quality and performance of filters or battery separator plates through a pore-structure analysis of the parts. It is said that such predictions can be made on any substance that has pores, including metals, fuels, plastics, chemicals, and ceramics.

The instrument works on the principle that mercury will penetrate the pores of any porous material if sufficient pressure is applied. Initially an experiment is run by placing a small sample piece of the material to be tested within a glass enclosure. Only pressures below atmospheric are used to force mercury into the pores

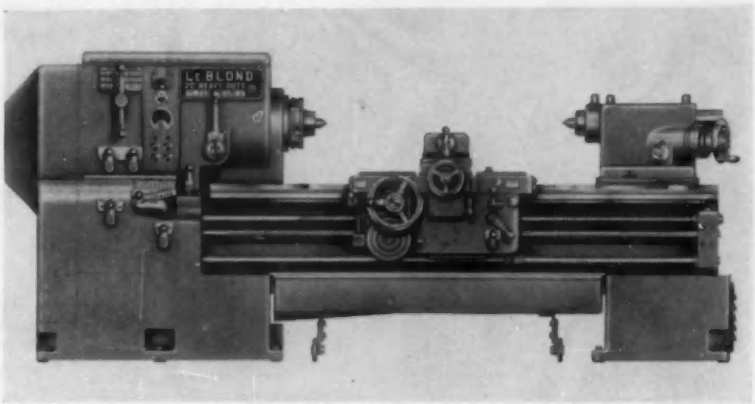


Porosimeter pore-structure instrument

while the sample is kept in this location.

To measure smallest-sized pores, the sample is moved to a vertically-sliding, stainless steel pressure vessel. Here, pressures up to 3000 psi are applied to the sample. Pressure is fed to the testing vessel through a series of stainless steel tubes. As pressure is raised, mercury is forced into smaller and smaller pores, the volumes of which are continually being indicated by the mercury level as it drops in the calibrated container. *Allegheny Ludlum Steel Corp.*

Circle 33 on postcard for more data



LeBlond 20-in. heavy-duty engine lathe features power utilization for most efficient use of ceramic and carbide tools

Lathe Engineered for Ceramics and Carbides

Designed to use 40 hp effectively, a new 20-in. heavy duty engine lathe is said to provide maximum efficiency with ceramic and carbide tools. In the headstock short, heavy shafts and fine-pitch, precision-ground gears deliver power to the spindle. Power at lowest speeds is at a high level, it being cited that at 10 rpm a cut can be taken as deep as ½ in. in 16-in. diam work, feeding at 0.063 ipr. Thirty-six speeds, from 10 to 1300 rpm, are provided. Selections are in fine increments, especially in the low range.

In the new two-speed tailstock, spindle travel is geared for conventional and low speed. When drilling, for example, the handle is pushed in to drill at a slow, powerful feed; handle is pulled out to retract quickly. The tailstock can be moved by power. According to the manufacturer, an exclusive worm and rack construction provides unusually long travel and positive lock against thrust, as well as full-length support of the spindle even when extended.

Controls were designed for operator convenience. To simplify changing speed and feed, selection levers are always moved toward the operator's position for increase; away from operator for decrease. Speed selection is color coded. Spindle is sensitively controlled by means of an electric clutch brake. Four-directional power rapid traverse is controlled by a single lever. There are built-in horsepower meter, chasing dial integral with apron, and quick-setting diameter reading dials on cross feed.

Other features include: hardened and ground replaceable steel bedways with compensating vee-way design; automatic lubrication; one-piece apron; flame-hardened rack; and totally-enclosed quick-change box. *The R. K. LeBlond Machine Tool Co.*

Circle 34 on postcard for more data

Welder Power Pack

Announcement has been made of a new power pack attachment for the 500-amp combination a-c and d-c Idealarc welder, designed to permit use of the welder as a power source for the manual Lincolnweld ML-2 semi-automatic submerged arc welder. This combination is intended to make a package capable of manual welding with d-c or a-c current, and submerged arc welding with d-c current.

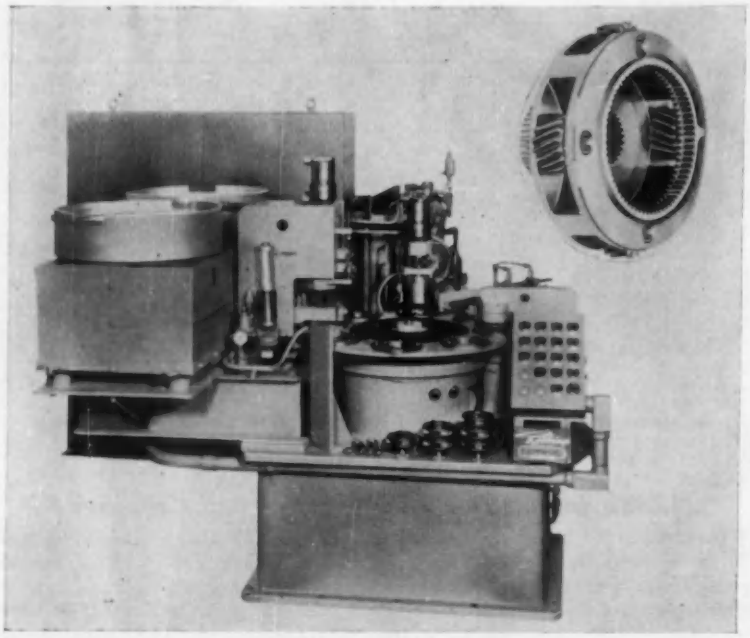
The Idealarc operates on single-phase input power. Generator power sources for the ML-2 submerged arc unit require three-phase current. The power pack mounts directly on the Idealarc welder and is easily connected. *The Lincoln Electric Co.*

Circle 35 on postcard for more data

Honeycomb Filler

Epofil B-1 is the designation of a material recently presented for filling stainless steel and aluminum honeycomb preparatory to contour machining. Said to have superior characteristics, it is a hot-melt wax-like substance which is easy to remove from the metal honeycomb after the machining operation. *Furane Plastics Inc.*

Circle 36 on postcard for more data



Robbins eight-station automatic assembly machine processes automatic transmission gear carrier assemblies at the rate of 720 per hour at 100 per cent efficiency

Eight-Station Automatic Assembly Machine

AUTOMATICALLY performing multiple operations, including press-fit inspection, on automatic transmission gear carrier assemblies, a new eight-station machine processes and inspects 720 assemblies per hour at 100 per cent efficiency.

Four pinions, with needle bearings and spacers for each, are previously assembled into the gear carrier and held in place with dummy pins. These assemblies are manually loaded into the machine. At the first station permanent pins are fed from two vibratory hoppers, shuttled into position, and pressed into the assembly, forcing out the dummy pins. The next station checks the press fit of each pin, automatically informing a built-in memory circuit in the electrical system if a pin does not resist a predetermined pressure. This memory circuit causes defective assemblies to be ejected automatically at the next station. Acceptable assemblies continue without interference through this station to the next where the pins are staked at each end to make a permanent assembly.

Fixtures float freely over the index table and ride up on stationary anvils at the operating stations, thus eliminating pressure on the index table. Positive alignment is assured at each station by hardened locating pins, which pick up locating bushings in the fixtures. In addition to automatic and manual "start" and "stop" buttons, the control panel has buttons which control individual machine movements, as well as offering forward and backward inching control of the table. A red light on the panel flashes whenever an assembly is rejected.

All stations on the machine are hydraulically-operated and have electrical interlock. Hydraulic and electrical equipment conform to JIC standards. *Omer E. Robbins Co.*

Circle 37 on postcard for more data

Oxy-Muffler Trucks

ANNOUNCEMENT has been made of the availability of Dynamotive GLF industrial trucks equipped with Oxy-Muffler catalytic exhaust purifiers that are said to reduce carbon monoxide in exhaust gases from 70 to 95 per cent.

The muffler is mounted horizontally on the back of the truck's counterweight. Exhaust gases pass through the connecting pipe to a venturi and air inlet. At the venturi the gases mix with fresh filtered air to assist the catalyst in its function. After leaving the venturi the mixture enters the specially-designed catalyst chamber, where the catalytic mass reacts on the hot gases, reducing to a safer level the carbon monoxide and organic material content of the exhaust output.

In the catalytic mass is a well containing a sensing thermocouple which registers on a meter telling the operator how the catalyst is functioning. The material is said to be effective for a minimum of 1000 hours. When the catalyst activity has declined and is no longer reducing the exhaust fumes, it can be replaced on an exchange basis.

The Dynamotive, an electrically-driven, gas-powered fork truck, is built with lifting capacities up to 10,000 lb. *Automatic Transportation Co.*

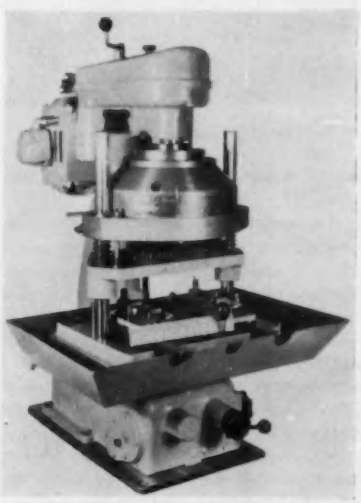
Circle 38 on postcard for more data

Drill-Press Tooling

THE application of a multi-spindle gearless drill head to a separate line of small drill presses has been publicly released. Presses can be equipped with small diameter, medium-duty drill heads. The table, which holds the part to be drilled, moves upward into the rotating drills. Travel of the table, feed into drills, and return travel downward of the table are automatic cycling. The table, in the illustrated application, carries an index fixture so that 25 spindles will drill a total of 50 holes, 25 holes simultaneously in two passes. The table is actuated by hydraulic control, with cylinder in the base.

Features of the drill press include small size (about three feet high), compact and self-contained operating mechanisms, and adjustability for height. Adjustable speed is an option. *Zagar, Inc.*

Circle 39 on postcard for more data



Zagar tooling on small drill press

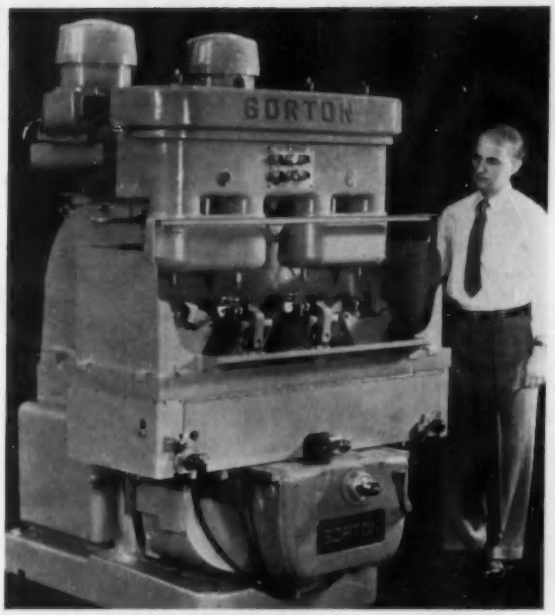
Production Comparator

RECENTLY unveiled was a comparator offered as a contribution toward closer control of high-precision production. The comparator, which is designed for use at the machine on close-tolerance grinding or lapping operations and close-tolerance segregating, provides two separate magnifications simultaneously without switch-over. This allows the operator to use the low magnification scale during the preliminary stages of his work, reading deviation from final size to 0.0001-in. increments. As finished size is approached, the operator can observe the high manification scale and read part size directly to within a few millionths. *Pratt & Whitney Co., Inc.*



Pratt & Whitney Dual-Aire Air-O-Limit comparator

Circle 40 on postcard for more data



Gorton special four-spindle vertical milling machine, designed to mill out two recesses in bevel gear blanks at the rate of 200 pieces per hour. It was tooled for a maximum centerline distance of four inches between each recess, but can be modified for varying distances. Other possible variations include incorporating a hydraulic valve to generate the profile either on the ID or OD of a piece part, as well as groove-type milling, keyway milling, face milling, either conventional or climb milling.

Special Four-Spindle Vertical Milling Machine

THE machine illustrated is a special four-spindle vertical milling machine which was developed to mill out two recesses in bevel gear blanks about three inches in diameter. Production is 200 pieces per hour. It was tooled for a maximum centerline distance of four inches between each recess, but minor modifications would reportedly make it possible to vary this distance considerably.

A stated feature of the unit is that it will produce up to the top speed of the operator who unloads and loads two fixtures while two workpieces are being machined in the other two fixtures. Infinitely variable feeds are available up to the capacity of any existing cutters. The machine was also designed with the view of adding three-dimensional hydraulic tracer control at any time in the future.

In operation, the operator loads the right-hand pair of the four rotating fixtures, pushes the hydraulic clamping level and cycle button; unclamps the other two fixtures, unloads and loads the clamps, and pushes the cycle button for the left-hand pair.As the cycle button is pushed for either pair of fixtures, the corresponding spindles rapid-traverse down to cutting position and lock in place, the table feeds in and dwells at full cutting depth, then the fixture revolves counter-clockwise to end of cut and dwells. The table then traverses out until cutter is 1/16 in. from opposite side of the bore. Fixtures rotate clockwise to second cutting position, then table feeds out and dwells at full cutting depth. Fixtures again rotate counter-clockwise during cutting and dwell at end of cut. Finally, table traverses out of the cut and spindles retract. Pieces are then ready to unload.

Spindles are belt-driven by two-horsepower motors; one motor for each pair of spindles. All movements of spindles, table and rotating fixtures are hydraulically-actuated with interlocked electrical controls for safety of cutters, parts and operator. *George Gorton Machine Co.*

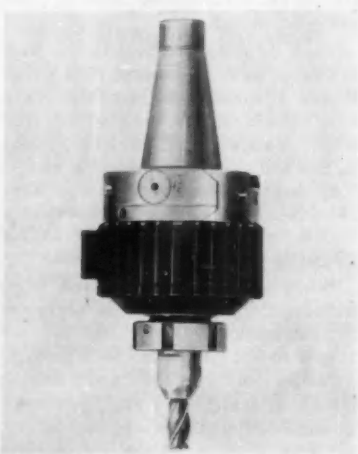
Circle 42 on postcard for more data

End Mill Driver

NOW being offered is an end mill driver that has a provision for offset positioning which produces an orbital (or eccentric) motion of the cutting tool. This orbital motion permits one-pass cutting of keyways with undersize end mills and partially eliminates the need for special-diameter sizes. It is also said to increase chip clearance, insure square slots, and permit milling true-to-centerline on keyways. The orbital motion has the same speed as the spindle.

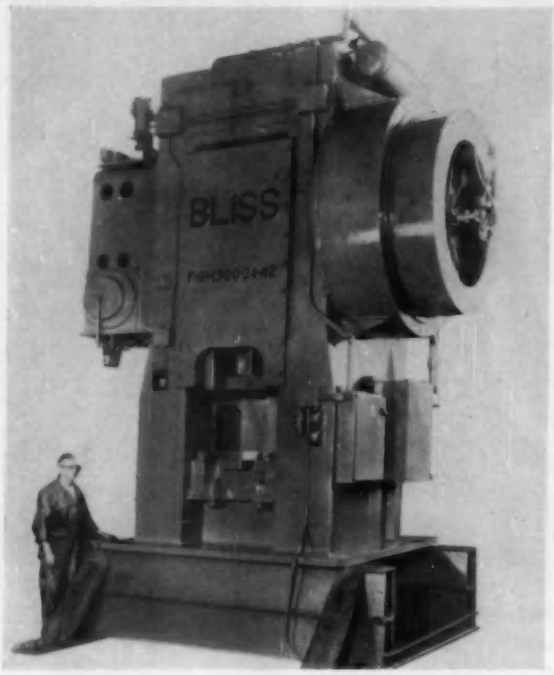
The end mill driver will accommodate end mill shank sizes from ⅜ to 1 in. The eccentric micrometer positioning ranges from 0 to 0.062-in. off center. *Portage Double-Quick, Inc.*

Circle 41 on postcard for more data



Portage end mill driver

Redesigned Line of High-Speed Forging Presses

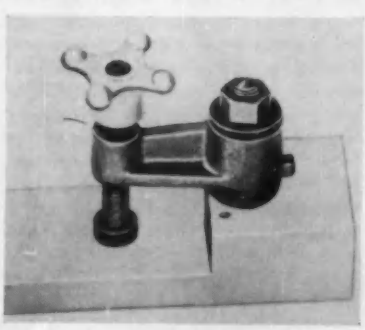


Illustrated is one model of a redesigned line of high-speed forging presses. Among the new features is a tonnage limiter which prevents accidental overloading of the press by reducing the air pressure on the clutch as the slide approaches the bottom of the stroke, and increasing it on the return. The brake has been redesigned and now utilizes a double clamshell type unit which, along with a larger cylinder, has doubled the braking effect. Other features include: air counterbalances instead of prior "buffers"; air-actuated wedge-type die seat; redesigned flywheel brake; and new gear drive for both the limit switch and lubrication pump. (E. W. Bliss Co.)

Circle 43 on postcard for more data

Revolving Clamp

A REVOLVING clamp assembly incorporating a detachable, spring-lock revolving shoe on a knob screw for positive workholding on uneven clamp-down, has been announced. Used for holding down work to be drilled or milled, the clamp assembly will operate with either left or right-hand swing. It is made of malleable



Jergens revolving clamp assembly

casting tumbled smooth, and is designed to quickly swing clear of work and fixture. Available in three sizes of 1½, 3 and 4 in., each assembly is applied by drilling and tapping one hole. *Jergens Tool Specialty Co.*

Circle 44 on postcard for more data

Chuck Control Units

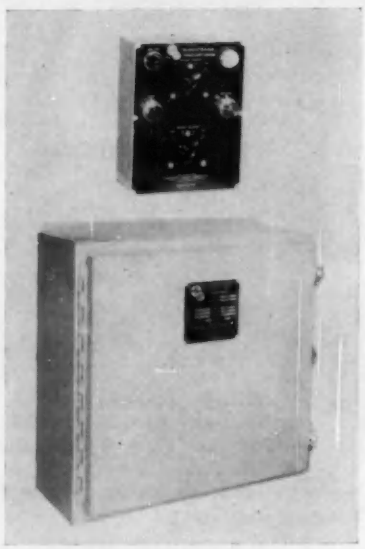
NEW Power-Grip control units for low - voltage (24 vdc) Sundstrand magnetic chucks have been announced in three basic types, available for use with chucks rated up to 4000 watts. The demagnetizing cycle for all control units requires a maximum of seven seconds. The units, consisting of a dust-tight control cabinet and remote control station, have been designed to machine tool standards, and operate from a 110-v a-c pilot circuit.

Type A units, smallest in the line, are rated up to 125 watts, with Types B and C units being available in a total of 15 ratings, ranging to 4000 watts. Basically, all models operate on the same principle using a heavy-duty power transformer and a selenium rectifier in a single-phase bridge circuit to furnish d-c power to the magnetic chuck.

When work is to be released, magnetism in the workpiece is overcome by automatically switching the d-c supply to the magnetic chuck through a series of forward and reverse pulses. A multi-lobed cam, driven by a sub-fractional horsepower motor, actuates a limit switch to energize and de-energize a reversing contactor in the d-c supply line between the rectifier and the chuck. These pulses become progressively shorter during the seven-second demagnetizing cycle.

The type A unit remote-control station has a three-position switch—hold, release, and off—and two indicator lights, one to indicate the a-c supply is "on" and the other to indicate d-c is being supplied to the chuck. The pilot light indicating that d-c is being supplied to the chuck flashes "on" and "off" during the seven - second demagnetizing cycle. Type B and C units use pushbuttons for hold and release, and, in addition, have a four-position tap switch to control degree of holding power.

Type C units have still another feature that provides extra demagnetizing power when needed. External



Sundstrand Type C Power-Grip remote control unit and panel for magnetic chucks. Upper four-position switch of control unit selects desired degree of holding power; lower switch selects demagnetizing power.

forces, such as heat and vibration from the action of a cutting tool, often extend the magnetic lines of force deeper into the workpiece than is normal from the magnetic field created by the chuck. Under these conditions, demagnetizing at normal power would not overcome this extended magnetic penetration. A second tap switch on the control unit has four positions, with No. 1 providing demagnetization at normal field strength and the other steps through No. 4 providing progressively higher field strengths. *Sundstrand Machine Tool Co.*

Circle 45 on postcard for more data

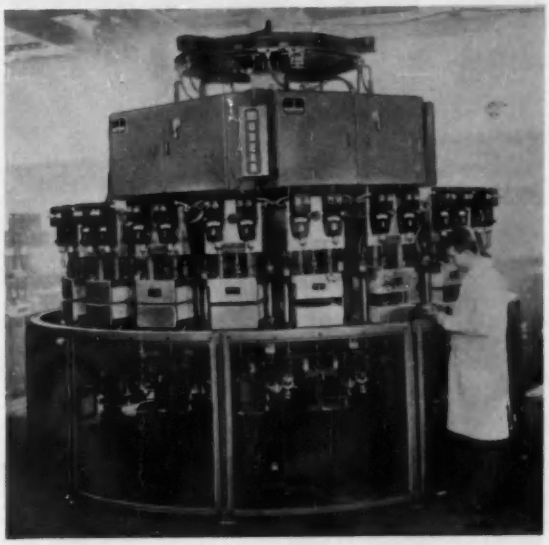
Multi-Station Rotary Bonding Machines and Allied Cold Press

AUTOMATIC multi-station bonding machines and a companion cold-assembling press are being offered in a line recently announced. The bonding machines range from single and multi-station stationary types up to 40-station rotary-cycle types, for permanently bonding liners to either internal or external surfaces. Applications include the bonding of linings to automatic transmission parts and brake shoes. The machines are said to give complete control of all variables of any bonding method, within the range and capacity of the units' instrumentation for pressure regulation, time and temperature.

Output per machine is dependent upon the number of stations provided as compensation for the required curing time (variable with the adhesive used) of about six minutes. A single-station model produces 10 parts an hour; a 40-station machine, about 400.

In one application of bonding a cone-shaped liner to a conical surface while maintaining proper lateral plane of the liner in relation to the metallic cone, a production rate of 200 units per hour was achieved with a 20-station machine. In this operation, parts (partially assembled in a new cold press, described later) are manually loaded and unloaded at one station of the machine. All other operations are automatic. When the liner and band assembly are placed in one of the special locating fixtures, a peripheral stationary cam under the guard rail actuates an air valve that controls a double-acting air cylinder. This brings the fixture into the clamping position at a pressure of 200 psi at the bonding line. The pressure-control valve at each station is variable to provide the exact pressure required. After partial rotation (10 to 15 deg from the load position), pressure in the fixture is eased sufficiently to allow any entrapped gases between the liner and the metallic cone to escape. The fixture then clamps again and remains clamped until the six-minute bonding cycle is completed.

The part clamped in the fixture is heated to 425 F of mandrel temperature, temperature being maintained through multiple 110-v resistance heaters, five in both the upper and lower platens. Each section has a temperature control gage to indicate individual temperatures. Temperature heat lights at each station visually signal temperature stage — red for power; green, when up to heat. Temperature is maintained within the bonding heat range by thermostatic-heat controllers.



The 20-station model of a new line of automatic multi-station rotary bonding machines developed by Modern Industrial Engineering Co. Designed primarily for bonding liners to automatic transmission parts, the machine offers complete process control. Each station of the model shown completes a bonded part in six minutes for a production rate of 200 per hour.

Companion equipment to the line of bonding machines is a special cold-assembling press. Using manual loading and unloading and an automatic work cycle, the two-station machine turns out 200 joined-for-bonding parts an hour. Fixtures are custom-tailored to the application.

When used for the automatic transmission part (the same part as previously discussed for the bonding operation), the cold assembling press locates, positions and preliminarily bonds a cone-shaped molded liner to the conical surface of a piston. The press operator places the piston and pre-treated (using oven-dried cement and a solvent activator) liner on the lower platen of one station and finger-positions them together. Both parts are held by a retaining collar. The automatic cycle then takes over, with the press ram being lowered against an expandable Neoprene mandrel to axially produce pressure about the entire liner area. This action provides positive location and avoids danger of securing the liner in elliptoid position. A holding pressure of about 400 psi is then applied by the ram and maintained for a predetermined cycle. Ram return is automatic. The operator loads one station while the other station is in automatic or manual operation. *Modern Industrial Engineering Co.*

Circle 46 on postcard for more data

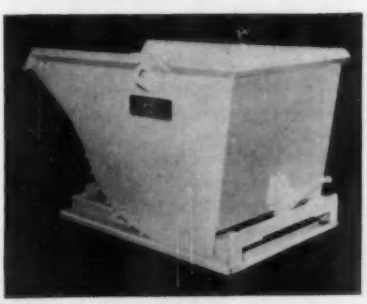
Self-Dumping Hoppers

INTENDED for industrial truck handling of wet or dry, cold or hot bulk materials, a line of hoppers just introduced may be dumped by releasing a gravity cam latch at the rear of the hopper. After the load is dumped, the hopper rights itself and locks into position. The hopper cannot disengage until again tripped by the operator.

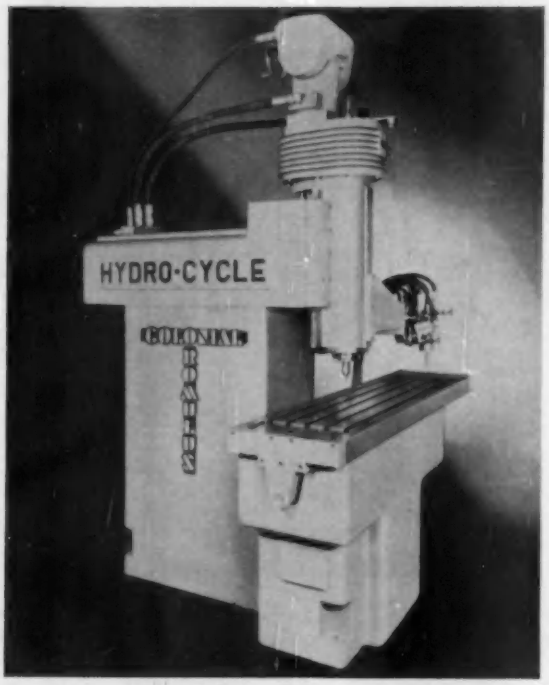
The equipment features all-electric-welded construction of steel plate and structural steel, and is designed for heavy-duty service. For storage, the hoppers are self-stacking and nesting without special lugs or attachments.

Five models are available in capacities of ½, ¾, 1, 1½, and 2 yards. Lengths range from 49 to 74 in., widths from 40 to 52 in., and heights from 35 to 46 in. *Apex Welding & Fabricating Corp.*

Circle 47 on postcard for more data



Apex self-dumping hopper



Colonial-Romulus Hydro-Cycle contour mill, one model of a line recently introduced. Using a hand-controlled tracer, the new machine is designed to facilitate the handling of a variety of work ranging from small forming dies to aircraft components. In addition to complete units, the machine is available as a contour milling unit for individual mounting or multiple setups on a common base.

Contour Mills Available in New Full Line

CONTOUR mills, designated Hydro-Cycle, are now obtainable in a full line from a recently-formed company division. The Hydro-Cycle machine is a hand-guided contour mill that is available either as a complete machine or as a contour milling unit for building-block erection. Both types are designed for handling a broad range of metals with high accuracy, applications ranging from small forming dies to aircraft components.

Hand control of the tracer stylus attachment is said to offer a true "feel" of the work so that irregular contours can be cut without complex equipment. Tracer and template are offset for operator convenience and safety. Micrometer adjustments accurately control the desired relationship between master and workpiece. The tracer attachment can be furnished with single dimensional (depth), two-dimensional (360 deg), or three-D control.

The Hydro-Cycle machine uses an 18-in. cross travel and a vertical travel of 12 in. It is available in standard longitudinal travel lengths of 32, 42 and 48 in.; other dimensions and travels can also be supplied. Spindle speeds are infinitely variable from 40 to 3000 rpm.

In the Erector model, the Hydro-Cycle is offered as a contour milling unit for individual mounting or multiple setups on a common base. It is basically the same as the complete machine, but designed for lighter requirements and versatility. Cross travels range from 12 to 36 in., with vertical travel of 8 in. Longitudinal travel lengths are offered to suit the application. *Colonial-Romulus Div., Colonial Broach & Machine Co.*

Circle 48 on postcard for more data

Tool Lubricant

IMPROVED Tapit compound is a threading and tapping lubricant that has been developed to reduce the risk of tap breakage by providing a protective film between tap and material. It is said to give exceptional results in working with the newer, tougher alloys, including titanium and stainless steels. The material is also usable in drilling, reaming, sawing, boring and broaching, resulting in increased tool life. *The DoALL Co.*

Circle 49 on postcard for more data

Finish-Stripper

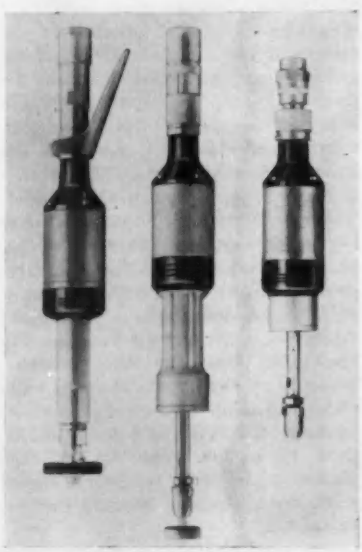
EPOXYSTRIP is the designation for an all-purpose finish-stripper which was introduced recently. Especially formulated to work on epoxy resin finishes, it will also remove paint, lacquer, enamel and other finishes from various metal surfaces. It is said that after about 20 seconds following application of the material, the treated epoxy resin will swell and come off. The residue can then be flushed away with water, leaving the metal surface clean and, after drying, ready for refinishing. One of its most important advantages, according to the company, is that it will not remove or damage phosphate coatings. *Beck Equipment Co.*

Circle 50 on postcard for more data

Small Wheel Grinders

THE addition of a new line of small wheel air grinders, known as the M1170 series, has been announced. Type designations are M1170 short, M1171 long, and M1172 small end. From the basic M1170 motor, of three speeds, 8000 12,000 and 17,000 rpm, with five spindles and three handles, 45 models and 20 different arbors and collets are available. In addition to versatility, principal features are stated to be 50 per cent more power, a new balanced centrifugal governor, simplified construction, and quieter operation.

Illustrated (left to right) are the



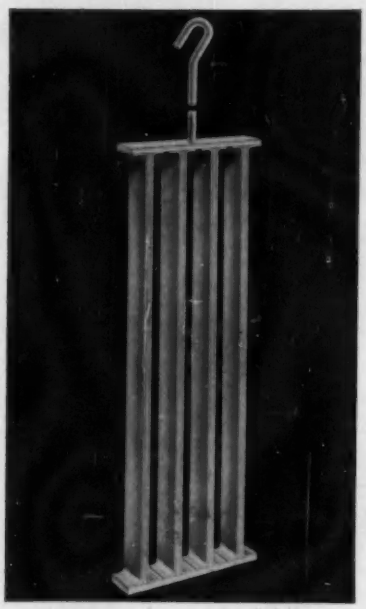
Rotor M1170 series air grinders

M1172 small end type with snap throttle, wheel arbor and straight wheel; the M1171 long type with standard spindle, twist throttle and ¼-in collet; and the M1170 short type with Q.A.W. sleeve throttle, standard spindle and ¼-in. collet. *Rotor Tool Co.*

Circle 51 on postcard for more data

Parts Carrier

MAGNE-CARRIER is the designation for a magnetic unit recently introduced for carrying parts on overhead conveyors. Made with permanent magnets, it eliminates the need for hooks, hangers or special conveyor devices. Parts are placed on the magnetic tines of the unit and are securely held for conveying through



Magne-Carrier conveyor parts carrier

such processes as cleaning, rinsing, painting and drying. The carrier is available with one to four tines and in varying lengths, depending upon individual load requirements. *Magnetool Div., Multifinish Mfg. Co.*

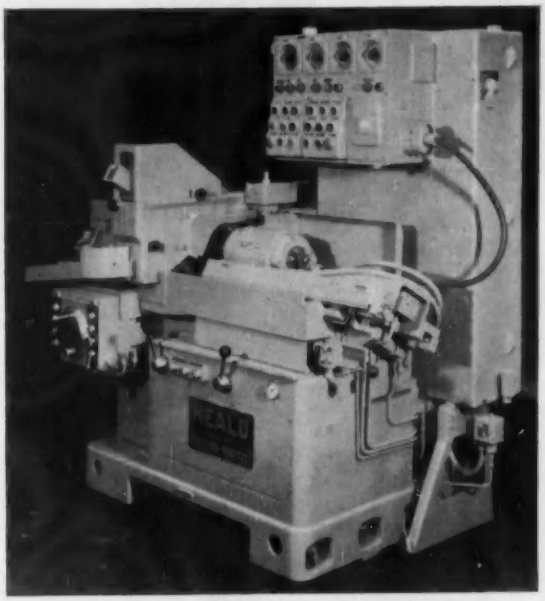
Circle 52 on postcard for more data

Speed Reducer

FEATURING flexibility of mounting arrangement, added safety, and lower maintenance expense, a new shaft-mounted speed reducer is available in most ratings from ¼ to 40 hp at output speeds from 10 to 420 rpm. Ratio changes can be made in minutes simply by changing pulleys; and a wide variety of pulley sizes makes the unit adaptable to a broad range of speeds. It is easily mounted on the driven machine, while a standard drive motor can be located on the ceiling, floor, wall or any position convenient to the user.

Compact and light in weight, the speed reducer has a full 360-deg mounting range around the driven shaft, and is adaptable to a variety of shaft diameters. The unit is available in single and double reduction types, in ratios of 5:1 and 15:1. *General Electric Co.*

Circle 53 on postcard for more data



Heald Model 190A Centri-Matic internal grinding machine with hi-frequency wheelhead, one of two Rite-Angle models recently introduced for handling workpieces up to 4½-in. OD. Maximum work length (standard) is 1½ in.; or 2 in. with special chutes.

Internal Grinders Feature Inclined Table Design

AN inclined table design is featured in the introduction of two Rite-Angle models of the Centri-Matic internal grinder: Model 190A for straight and taper boring, and Model 1901A for ball track grinding. Both are fully automatic machines for work up to 4½-in. OD requiring precision internal size and finish, such as anti-friction bearings, retainer rings, gear blanks, compressor rolls, bushings and similar parts. They are said to be capable of heavier stock removal and to reduce cycle time up to 50 per cent, with no sacrifice in work quality.

The wheelhead table is inclined at an angle of 30 deg to the work. This is stated to provide solid wheel backup to take heavy wheel pressure, true table tracking, improved swarf and coolant drainage, and a superior base for mounting wheelheads. In operation, work is located and rotated on its own periphery against hard shoes, and clamped against a rotating backing plate. This workholding method is said to maintain the advantages of centerless grinding, while tending to bridge any waves present in the OD, thus producing concentricity between the ground bore and OD.

Design and operating features of the machines also include: vee-way accuracy of alignment with hardened-and-ground box-type ways; operation with hi-frequency or belt-driven wheelheads; infinitely-variable hydraulic cycles; automatic feed control with self-adjusting diamond; and solid plug or air sizing for straight or taper bores. *The Heald Machine Co.*

Circle 54 on postcard for more data

Hardening Compound

CALLED Chromelloy, a steel hardening compound recently introduced is said to harden mild steels from the surface inward by a carburizing, nitriding and alloying effect, which often gives, in addition to hardening, an increase of tensile strength throughout the steel. It can be used for hardening a variety of steel for production tools, as well as parts. In application, small tools or parts are heated in a forge or flame, dipped in the Chromelloy powder, then reheated for about two minutes, and quenched, giving a case several thousands in depth. One hour of pack hardening will reportedly produce a 1/32-in. case of 65 to 68 Rc, using cold rolled steel. *United States Metallurgical Laboratories.*

Circle 55 on postcard for more data

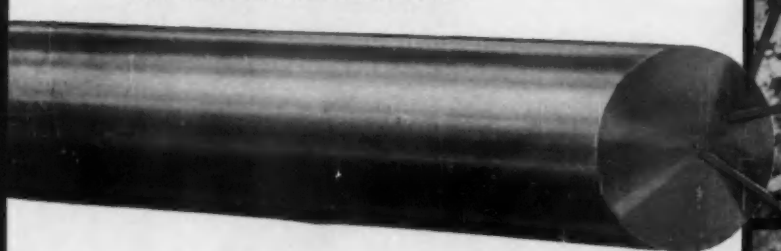
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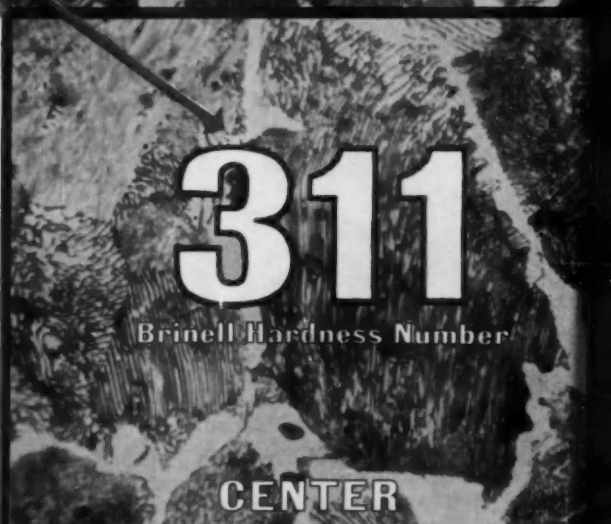
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FREE LITERATURE

Oil Seals 1

Catalog 856-C, 68 pages, lists a line of oil seals and includes an engineering data section giving full application data. *Chicago Rawhide Mfg. Co.*

Hose Clamps 2

Form A-457, four pages, describes a series of hose clamps designed for automotive, industrial, and other applications. *Wittek Mfg. Co.*

Wire Markers 3

Two-page bulletin lists a new line of aluminum foil wire markers that are furnished on quick-release dispenser cards. *North Shore Nameplate, Inc.*

Commercial Glass 4

Bulletin B-83, 16 pages, lists selected commercial glasses and discusses their mechanical, thermal, and chemical properties. *Technical Products Div., Corning Glass Works.*

Bearings 5

Catalog 57, 16 pages, covers self-lubricating oil-impregnated bronze and iron bearings of standard sizes, and includes selection and application data. *Asco Sintering Corp.*

Cutting Knives 6

A 16-page bulletin on a line of metal-cutting knives designed for various types of metal shearing has been issued by *The Hill Acme Co.*

Metal Putty 7

An epoxy-based compound metal putty used to fill blowholes in castings and to eliminate small defects in precision metal parts is described in bulletin 134. *Carl H. Biggs Co.*

Punch Presses 8

Turret punch presses for short-run piercing of component parts for trucks and related equipment are covered in Bulletin 600-TR, six pages. *Wiedemann Machine Co.*

Welding Process 9

Unionarc welding, a semi-automatic process using a continuously-fed bare wire, powdered magnetic flux, and CO_2 gas, is described in three bulletins (F-1076, F-1060, and F-1066) available from *Linde Co.*

Precision Tools 10

Catalog 36M, 96 pages, lists a complete line of precision tools and gage equipment, including many recently-introduced items. *Brown & Sharpe Mfg. Co.*

Descaling 11

Bulletin 128-D, eight pages, tells how an airless abrasive blast machine, combined with flash pickle, descales carbon steel strip; and includes information on the mechanical descaling of stainless and hot rolled steel. *Wheelabrator Corp.*

VOID After Aug. 15, 1957 **6/15/57**

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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
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Solenoid Valves 12

A series of two-, three-, and four-way solenoid valves, for use with media such as air, gases, water, gasoline, and lubricants, is listed in detail in eight-page catalog D2. *The Skinner Chuck Co.*

Molding Presses 13

Fully automatic compression molding presses, in a new series comprising four models of 50, 75, 125 and 200 tons capacity, are described in 12-page catalog 200. *F. J. Stokes Corp.*

Stainless Forms 14

Stainless steel bar and wire is the subject of a new 24-page booklet, which describes the properties of 45 types of stainless steel available in these forms. *Armco Steel Corp.*

Hard Coating 15

The benefits of a proprietary process which deposits a hard, dense, nonmagnetic alloy on base metals, are explained in a 24-page booklet issued by *The Electrolizing Corp.*

Grinding Wheels 16

Permanent form control of grinding wheels, using cutters of cemented diamond particles, is discussed in a six-page brochure. *Koebel Diamond Tool Co.*

Ultrasonic Gaging 17

Bulletin V-200, eight pages, gives technical data on an ultrasonic resonance instrument designed for fast, non-destructive testing. *Branson Instruments, Inc.*

USE THIS POSTCARD

Hydraulic Cylinders 18

Bulletin 57-68, nine pages, is a revised edition covering latest improvements in a line of "compact" 2000-psi hydraulic cylinders, including new trunnion-mounted units. Engineering data for application is also included. *Vickers Inc.*

Stainless Fasteners 19

Fastenings and other stocked parts of stainless steel, including capscrews, nuts, washers, rivets, flanges, and hinges, are listed in 24-page catalog 56-A, available from *Star Stainless Screw Co.*

Single Point Tools 20

New catalog 571, 23 pages, covers three separate lines of single point lathe tools. Two of the three sections list single point tooling that utilize throw-away inserts; the third section describes extra heavy duty regrindable insert tools. *The Viking Tool Co.*

Leaded Alloy 21

The properties of a chromium-molybdenum 0.40 carbon alloy steel containing 0.15 to 0.35 per cent lead for increased machinability, are contained in eight-page bulletin 14-5. *Joseph T. Ryerson & Son, Inc.*

Expansion Joints 22

Rubber, Neoprene and Teflon-lined expansion joints, their construction, sizes and uses are explained in bulletin AD-137 issued by *The Garlock Packing Co.*

Cutting Tools 23

High-strength oxide-base cutting tools are detailed in new 12-page catalog 257, which includes toolholders, throw-away inserts, solid inserts and unground blanks. *Stupakoff Div., The Carborundum Co.*

Adhesives, Sealers 24

Adhesives, protective coatings and sealers, in the Ray-Bond line, are fully described in four-page folder 650A, which presents their properties, methods of applications and other details. *Raybestos-Manhattan, Inc.*

Small Parts

A kit has been made available to acquaint product designers with the possibilities for cost reduction in small parts components through the company's tiny precision die castings and thermoplastic mouldings. Address request on company letterhead to *Gries Reproducer Corp., 400 Beechwood Ave., New Rochelle, N. Y.*

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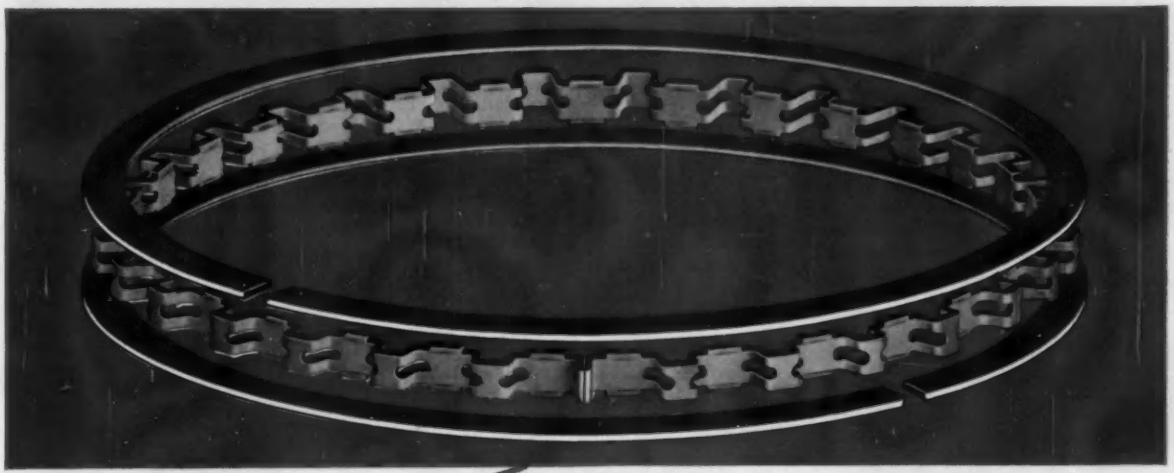
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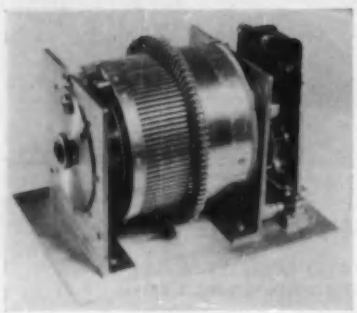
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NEW PRODUCTS
AUTOMOTIVE-AVIATION

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 89

Multiple Time Control

For automatically providing repetitive sequences of operations, a new multiple-time controller is being offered that is applicable to fabricating processes and product functions. It may be used for controlling a number of operating units whose time intervals are of regular or irregular duration. Relay-controlled devices can be activated and deenergized intermittently, simultaneously, or in combinations where several interrupted phases of a given operation are involved. The device is settable to accommodate changes.



Design of the unit enables synchronism to be effected with either an adjacent operation, or with the time of day. While basically a mechanical instrument, it is powered by a standard electric motor. *A.R.T.H., Inc.*

Circle 60 on postcard for more data

Surface Treatment

Public announcement was recently made of a chemical surface treatment which is said to provide a substitute for tin, as well as giving chemical and corrosion resistance to a wide range of metals. Called the Hinac process, it is also said to provide a superior base for paint. It may be applied to plain carbon steel or such metals as stainless steel, aluminum, zinc, etc.

The process produces an inorganic coating consisting essentially of chromium compounds. It is stated to be particularly adaptable to high-speed operations such as strip and sheet lines, since the total processing time requires only a few seconds. The composition and thickness of the coating can be varied to suit the product's end use. *Heintz Manufacturing Co.*

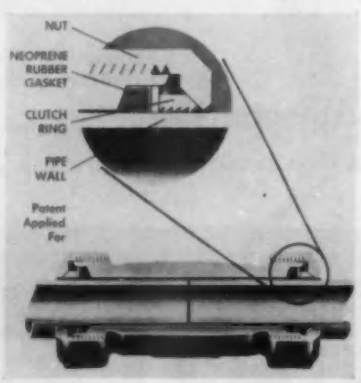
Circle 61 on postcard for more data

Threadless Fittings

Threadless pipe fittings that will reportedly withstand traction forces up to 3600 lb and hydrostatic pressures ranging from 450 psi on 2-in. pipe to 5000 psi on ½-in. pipe have been announced. They are factory assembled, ready for use in joining steel, wrought iron or plastic pipe. No threading, grooving, flaring, soldering or welding is necessary.

Gripping action is achieved through a brass clutch ring with internal serrations which grip the pipe wall as the fitting nut is tightened. At the same time, a Neoprene gasket is compressed against the pipe wall. This design is said to provide a permanent seal against leakage of gas or liquid, as well as resistance to vibration, contraction or expansion.

The fittings are available in couplings, adapters, 90-deg elbows, and tees. Machined-brass stiffeners are also available for use when joining plastic tubing. *Telsco Fittings Div.*



Circle 62 on postcard for more data

Self-Threading Locknut

A locknut which cuts its own threads on die-cast or cold-forged studs of nameplates, medallions, moldings, etc., has been announced. Made of spring-tempered steel and equivalent to a thread-cutting locknut and flat washer in one piece, it is available in sizes for ⅛, 3/16 and ¼-in. unthreaded studs.



Threads cut are said to be deep and clean and to have high torque and tensile values. The nut may be removed and re-used on the same stud. Parts are pulled up tight with a strong resilient spring locking action. Its resilient washer base gives full contact on flat or irregular work surfaces, and on perpendicular or off-angle studs. The locknut is available plain or with bonded-in plastisol sealer. *The Palnut Co.*

Circle 63 on postcard for more data

High-Speed Steel

Future orders for round Rex high speed steel bars in sizes ¼ in. and larger will be supplied with an improved finish, according to a recent announcement. The improved finish, made possible by new equipment, offers greater uniformity from bar to bar, closer tolerances, and some weight saving. *Crucible Steel Co. of America.*

Circle 64 on postcard for more data

Alternators

Permanent-magnet alternators of a new type are in an extensive line of brushless generators recently announced. Their rotor construction is said to utilize an entirely new principle of design which can withstand high acceleration and over-speed conditions, and permits drive by electric motors, jet air drives, turbines, and gasoline engines. Due to ability to operate at high speed, smaller sizes and weights than conventional generators are possible. The first production unit, Model 5854, 400-cycle alternator is rated at 12,000 rpm con-



tinuous duty. Since the alternators use permanent magnetic fields, they require no external excitation and no slip rings, commutators or brushes. Claimed resultant advantages include durability, reliability and excellent wave form for aircraft, guided missile, automotive and industrial applications.

The alternators are being offered for most standard voltages, 400-cycle, single phase; or three phase, either wye or delta connected. Other available configurations include compound units delivering both ac and dc, with built-in forced aircooled rectifiers; two-bearing type units for belt or direct coupling drive; and units with standard AN pads for hydraulic motor drives. Output ratings range from 500 to 4500 va. *LearCal Div., Lear, Inc.*

Circle 65 on postcard for more data

Nylon Batting

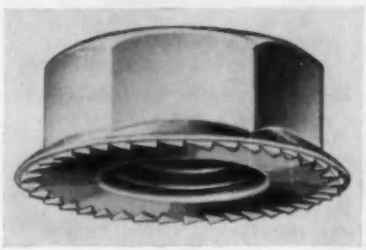
A new type of self-supporting batting made of nylon fibers is said to have characteristics useful for thermal insulation, liquid and gaseous filtration, vibration and shock absorption, padding, and packing applications. Called Ny-Sul-Loft, the material is made by crimping nylon fibers and then permanently locking them together by a chemical-thermal process. The fiber crimp gives the fabric added tensile strength and loft as well as imparting to it permanent resilience. Produced in a range of weights from 2 to 8 oz per square yard, it is available in any width up to 55 in. *Star Woolen Co.*

Circle 66 on postcard for more data

Locknuts

Commercial availability of Spin-Lock nuts, which combine the function of nut and lockwasher in one piece, has been announced. They are available in sizes ranging from No. 8 to ½ in.

The toothed structure on the base of the nut bites into the bearing surface of the metal being joined, resisting tendency to loosen. It is said the torque required to loosen the nut is actually greater than the tightening torque. Savings in application time result; the teeth provide an excellent contact for electric equipment. The



nuts are hardened for carrying heavy loads. Teeth are not deformed in use and the nut may be re-used.

Spin-Lock screws in a variety of head styles are also available. *Russell, Burdsall & Ward Bolt and Nut Co.*

Circle 67 on postcard for more data

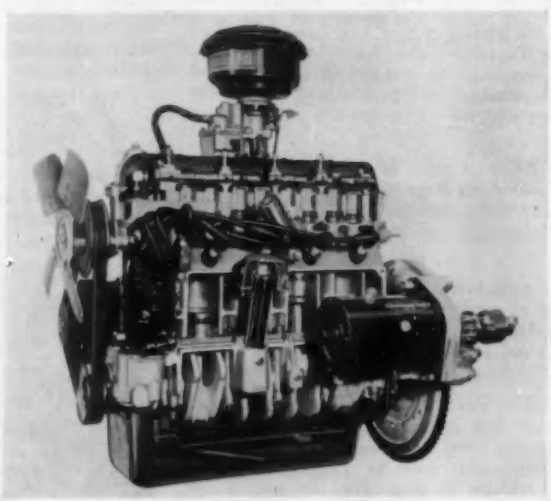
Compact, Light-Weight Industrial Engine

Featuring compactness and light weight, an industrial engine just announced produces up to 45 hp at 5500 rpm with a running engine weight as low as 160 lb, equivalent to a power-to-weight ratio of 3.55 lb/hp. Known as the Fageol 44, the 44 cu in. displacement engine measures 23⅝ in. long including SAE No. 5 bellhousing, 15 9/16 in. wide, and 23⅞ in. high.

It is a four-stroke, four-cylinder, watercooled unit, with 9:1 compression ratio and overhead valves operated by a gear-driven overhead camshaft. The cylinder head is cast integral with the block, eliminating head gasket. Other stated features include: full-pressure lubrication, built-in oil cooler, removable water jacket side plates on both sides of block, and statically and dynamically balanced crankshaft and flywheel. Also forged steel connecting rods and camshaft, insert bearings, two-piece valves with flame-hardened tips, exhaust valves Stellite-faced, and rotators on all valves.

Standard equipment includes 6-v, 35-amp generating system, solenoid-actuated starter, oil bath air cleaner, fan, and distributor or magneto. Cast aluminum cylinder block, mechanical or velocity-type governor, and supercharger are available options. *Fageol Products Div., Twin Coach Co.*

Circle 68 on postcard for more data



Fageol 44 industrial engine is less than 24 in. long, produces up to 45 hp with a running weight as low as 160 lb. Features include overhead camshaft, and cylinder head cast integral with block.

AI TABLOID

(*Continued from page* 37)

Boyertown Auto Body Works has announced a new 1957 version of its Merchandiser delivery truck body.

* * *

Hayes Metal Products Co. has closed its plant at Grand Rapids, Mich.

* * *

B. F. Goodrich Co. will construct a new textile processing plant in Exeter, Pa. . . . Allen Mfg. Co. is building a new plant and main office in Bloomfield, Conn.

* * *

Black & Decker Mfg. Co., Ltd., has purchased a Canadian manufacturing plant in Brockville, Ont.

* * *

American Society for Abrasives is name of new organization formed to cover many different facets of the abrasive field. Present headquarters are located at 222 Berks County Trust Bldg., Reading, Pa.

* * *

U. S. Rubber Co. will spend $1 million to expand production facilities for nylon tire fabric at its Scottsville, Va., plant.

* * *

Superior Tool and Die Co. has bought Peerless Engineering, Ltd., of Canada. . . . Chicago Pneumatic Tool Co. has purchased the manufacturing facilities and goodwill of Pressluftwerkzeug und Maschinenbau, Germany.

* * *

D. Napier & Son, Ltd., and Aerojet-General Corp. have signed an agreement to exchange technical knowledge on liquid fuel rocket engines.

* * *

Selas Corp. of America has formed an Export Div. . . . Shallway Corp. has set up a Used Shell Equipment Div.

* * *

Allegheny Ludlum Steel Corp. is expanding its research and development laboratory in Brackenridge, Pa.

* * *

The Pratt & Whitney Aircraft J-57 and J-75 have been certified by the Civil Aeronautics Board for commercial use by airlines.

(*Turn to page* 174, *please*)



Baker-Raulang Co.—Eugene Caldwell has been elected president.

MEN *in the* NEWS

(*Continued from page* 41)

Westinghouse Electric Corp.—**Roger H. Bolin** has been appointed advertising director.

Bendix - Westinghouse Automotive Air Brake Co.—**Willard B. Paine** was elected executive vice-president.

American Brake Shoe Co.—**John R. Welsh** is now assistant general purchasing agent.

Industrial Wire Cloth Products Corp. — **H. Joseph Markert** was appointed president, and **Justus P. Nesbitt** was named vice-president and general manager.

Sheffield Corp. — **E. M. Hakanson** was appointed manager, and **C. H. Laemmel** was named assistant manager of the Machine Tool Div.; **D. H. McDonnell** was appointed manager of the Autometrology Div., and **Henry Boppel** and **Arthur Wiseman** were named assistant managers. **O. A. Ahlers** was made director of the Machine Tool, Contract Mfg. & Threadwell-Conway Tap & Die Product Div.; **W. Fay Aller**, vice-president of Autometrology, Standard Production Instrument, and Fixed Gage & Inspection Instruments Divs.; **J. T. Welch**, assistant vice-president and coordinator of the national field sales organizations; **William I. Wilt**, assistant vice-president of the Standard Production Instrument Div.; and **W. J. Darmody** technical metrology assistant to the president.

Clark Equipment Co., Industrial Truck Div.—**L. A. DePolis** was named director of sales; **Bert E. Phillips**, sales manager; **Phillip E. Campbell**, sales manager of the gas truck section; and **John Borman**, sales manager of the attachments section.

(*Turn to page* 172, *please*)



Panellit, Inc.—William B. Denniston has been made sales manager.

Industry News

(*Continued from page* 39)

Piasecki Develops Plans For "Airail Car" System

Piasecki Aircraft Corp. has disclosed the development of plans to produce an "airail" car system based on aeronautical principles. It is claimed that the car could soar along an overhead rail at speeds over 100 mph.

The car reportedly would be gasoline-powered, driven by a propeller in the rear, and stabilized by fins for smooth riding. It is designed to hang beneath a "safety rail" and could be operated in either single or multiple units, the company said.

According to present plans, Piasecki would manufacture the cars on customers' orders. The overhead tracks probably would be made by structural steel erecting groups working closely with Piasecki.

Vehicle Scrappage in '56 Reached an All-Time High

Vehicle scrappage in 1956 rose to an all-time high. A preliminary count shows that more than 4.6 million units hit the junk heap last year, compared with 4.3 million in the previous year.

The total included approximately four million cars and 600,000 trucks. The figure compares with 3.7 million cars and 623,000 trucks in 1955.

Massey-Harris-Ferguson Detroit Plant Expanding

Massey-Harris-Ferguson will more than double the size of its Detroit tractor plant from the present 136,000 sq ft to 376,000 sq ft. As a result, production of tractors will be tripled to approximately 250 units daily on a one-shift basis. The plant currently is turning out 77 units a day on a curtailed basis. When the expansion is completed at the end of this year, employment will be increased to nearly 600 persons.

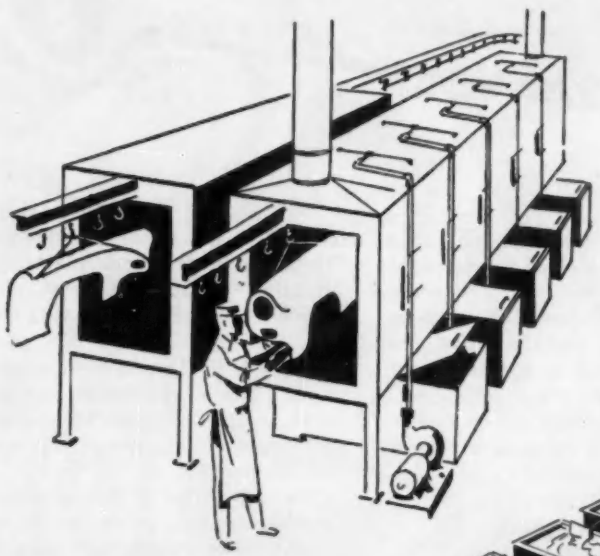
Erratum

It was erroneously stated in an item appearing on p. 33 of the May 1 issue of AUTOMOTIVE INDUSTRIES that Buick, Oldsmobile, and Rambler are the only makes currently offering station wagons with hardtop styling. Mercury should also have been included in the group.

(*Turn to page* 169, *please*)

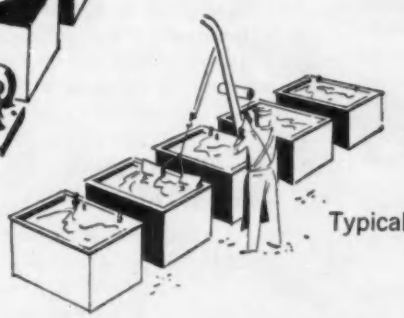
ACP *Chemicals and Processes* for the automotive industry

treat metals fast and economically



Typical power spray system

ACP produces the chemicals for treating most metals—to clean them, to prepare them for further processing, to improve corrosion resistance and paint adhesion. It has the experience and the personnel to apply these chemicals economically and effectively, too. Here are just a few of the many products and processes ACP offers:



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ACP GRANODINE®—a phosphate coating process for steel which provides an excellent base for paint and greatly improves the corrosion resistance of the paint system.

ACP ALODINE®—an amorphous coating process for aluminum which protects both painted and unpainted metal and anchors the paint finish.

ACP PERMADINE®—a zinc phosphate coating chemical which forms a heavy oil-adsorptive crystalline coating on steel. This coating bonds paint or readily absorbs such rust inhibiting oils as ACP Granoleum.®

ACP DURIDINE®—a dual-action chemical which cleans and phosphate coats steel simultaneously. It carries off harmful surface dirt, oil and grease. It forms a coating which inhibits corrosion and provides an excellent base for the paint finish.

ACP DEOXIDINE®—a phosphoric acid metal cleaner which removes rust and organic soils, destroys rusters, prepares steel, aluminum, brass, copper and other metals for painting.

ACP METAL CLEANERS—Ridoline,® alkaline metal cleaner, and Ridosol,® solvent-detergent metal cleaner—remove metal preservatives and metal-working lubricants from metals in process.

ACP THERMOIL-GRANODINE®—a manganese iron phosphate crystalline coating chemical which improves the wear-resistant and antigalling characteristics of machined reciprocating ferrous elements. The coating, when oiled or painted, also inhibits corrosion.

ACP GRANODRAW® for steel and **GRANODRAW SS®** for stainless form an integral coating with the metal which facilitates cold mechanical deformation, improves drawing characteristics and lengthens die life.

Write for the "ACP GUIDE to the chemical treatment of metals."



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New Chemical Horizons for Industry and Agriculture

AIR BRIEFS

By RALPH H. McCLARREN

Finances for Jet Age Transportation

Successful financing of the jet age in scheduled air transportation materially depends upon allowing the airlines to charge the right price for the service they have to sell. This statement was made by T. Carl Wedel, vice president of The First National City Bank of New York, who addressed the Aviation Writers Association Convention dinner, sponsored by the Air Transport Association, at St. Louis, Mo., on May 30.

From a banker's viewpoint even the best airline, to attract the money it needs, must earn a return of over 11 per cent on its book net worth, but the industry, as presently regulated, does not give promise of being able to earn this rate of return.

"The key to the airlines' problems of financing the new equipment," Mr. Wedel said, "seems clearly to be increased earning power now so they can put on a little muscle in working capital to keep them warm against the cold, cash draining, winds of the jet pre-operating and break-in expenses—and so that they can raise additional equity in the market without burning present stockholders."

Mr. Wedel pointed out that the cost to the airlines of putting an available seat mile into the sky has increased steadily since the advent of the DC-6B.

"In view of this," he said, "this increase in earning power can only be attained in the amounts necessary by allowing airlines to charge the right price for their main product—available seat miles."

Mr. Wedel said the seat mile prices for all services for domestic scheduled airlines was 5.30 cents in 1956, as against 5.75 cents in 1948. And while the price has actually declined in the last eight years, the product was getting better, a statement that can be applied to very few products in our economy today, he said.

Air Frame Problems In Nuclear Aircraft

The world's first atom-powered airplane will have straight wings, engines in the fuselage, a superstrong landing gear and, to protect its crew from nuclear radiation, divided shielding.

This concept was revealed in the June issue of *Aeronautical Engineering Review*, published by the Institute of the Aeronautical Sciences, in an article entitled "Design of Air Frames for Nuclear Power." by C. L. Johnson and F. A. Cleveland of Lockheed Aircraft Corp.

Until recently, the study was classified by the Government. The article brings it into the open for the first time as a full-length technical contribution to advancement of the aeronautical sciences.

Four-Rotor Helicopter

Convertawings, Inc., Long Island helicopter company, has been awarded an Army contract to investigate its four-rotor configuration.

The research and development contract which was let by the Department of the Army, Transportation Research and Engineering Command Fort Eustis, Va., calls for engineering study and research testing of the quadrotor design. The Army contract culminates an intensive privately financed development program conducted by Convertawings during the past four years on the four-rotor machine. The configuration proved itself feasible in March 1956 when the company flight tested a prototype quadrotor.

The four-rotor design was undertaken by Convertawings in an effort to meet today's requirements for a helicopter which would have a heavy lift capacity; and, at the same time, through the advantages of simple component parts, increased safety and easier maintenance.

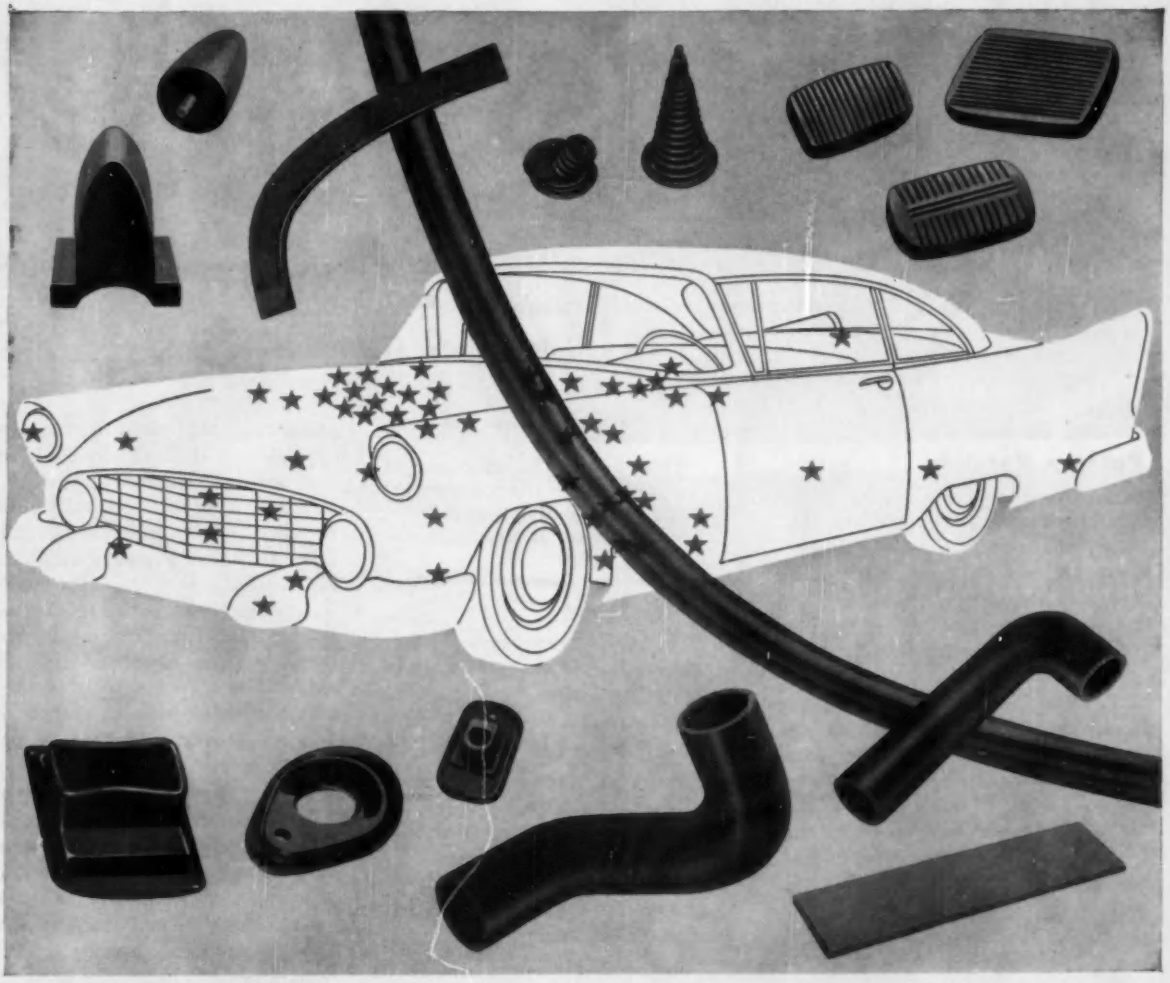
Improve J79 Jet Engine

The General Electric Company's Aircraft Gas Turbine Division at Cincinnati has been awarded a $12 million Air Force contract for engineering design studies to further improve the J79 jet engine.

Maj. Gen. E. W. Rawlings, commander of the Air Material Command, said the contract was part of an estimated $32 million product improvement program for the engine. General Electric engineers have carried on a continuing program for advancing the design and applications of the J79, which has more thrust per pound of engine weight than any aircraft power plant in the 10,000-lb thrust class.

The J79 powers the Convair B-58 Hustler, the Air Force's first supersonic bomber, the Lockheed F-104A Starfighter, the world's fastest production fighter, the Navy Grumman F11F-1F Tiger fighter, and the Regulus II ground-to-air missile.

(*Turn to page* 145, *please*)



★ some of the more than 100 places where ENJAY BUTYL works, silently and dependably, helping to improve the performance of today's new cars.

ENJAY BUTYL—fabulous all-weather rubber BOOSTS PERFORMANCE IN '57 CARS

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The BUSINESS PULSE

Business Outlook for Second Half of '57 Remains Uncertain. Encouraging Signs Are Seen in the Stability of Industrial Production, Employment, and Retail Sales. Stock Prices and Bond Yields Maintain High Levels.

Mixed Business Pattern Persists

A mixed business pattern has persisted during the past month, with inflationary and deflationary influences seemingly in very close balance. Because of this situation, uncertainty respecting the course of business over the remainder of the year lingers on.

Such aggregate measures of activity as industrial production, retail sales, and employment have changed very little. On a seasonally adjusted basis, the Federal Reserve Board's index of industrial production stood at 145 per cent of its 1947-49 average in April, one point below the March level but only two points below its all-time high. The fact that output has held so close to its previous record in recent months is encouraging, since this has occurred at a time of an adjustment in the inventory policies of businessmen from accumulation to at least modest "disinvestment."

Retail sales also have been steady, on a seasonally adjusted basis, the total for April having approximated the monthly figures for the preceding half year. In one sense this is disappointing, considering the continuing uptrend in personal income and the advance of some retail prices. But it has to be appreciated that an increasing total of consumer incomes has been absorbed by service expenditures (apparently in large part because of rising prices), thus reducing sums available for commodity purchases. Moreover, consumers as a whole have adopted a cautious attitude with respect to the assumption of new debt, a fact which has favorable implications for the future, even though it is now operating to slow the rate of consumer purchases.

This Survey Is Prepared Exclusively for AUTOMOTIVE INDUSTRIES by the Guaranty Trust Company of New York.

Labor Market Is Stable

Labor-market conditions remain generally satisfactory, subject to the qualification that cross-currents underlie aggregate stability. So far this year, changes in both employment and unemployment have, by and large, accorded with the seasonal pattern of previous years. In April some 2.7 million persons were estimated to be unemployed, representing about four per cent of the labor force. While this is a somewhat higher ratio than seems to be regarded as representative of "full employment," it presumably is not one that would be adjudged by many as indicative of widespread hardship.

Hopes Fade for New Car Boom

The automobile market has remained comparatively quiet, and time is rapidly running out on those who still entertain hopes of a sharp upsurge in sales volume. We are now well into the period when the boom should have materialized if it was going to, and it has not. The result is that producers seem to be reconciling themselves to much the same sort of record this year as last, for the industry as a whole. Present expectations, that is, are for new-car sales in 1957 of about 5.8 million units, which contrasts with a forecast of 6.5 million units made by most producers last autumn. This situation suggests that output will have to be kept under tight rein through the third quarter of this year; this means that there is little likelihood that the automobile industry will become a factor of expansion as far as the over-all business picture is concerned before the final quarter, if then.

Tendencies in the construction industry continue to show the same diverse pattern that has prevailed over the past year. April data on outlays for new construction show the dollar total holding steady, with strength in public construction and private business construction being offset by weakness in private residential activity. Housing starts did register a more than seasonal gain in April, but it is too early to know whether the decline in this sector of the industry has been definitely arrested.

Price movements have been similarly mixed. The slow but persistent uptrend at retail levels is still in evidence, but in primary markets there continue to be important areas of price weakness. During May, nonferrous metals in particular were subject to pressure.

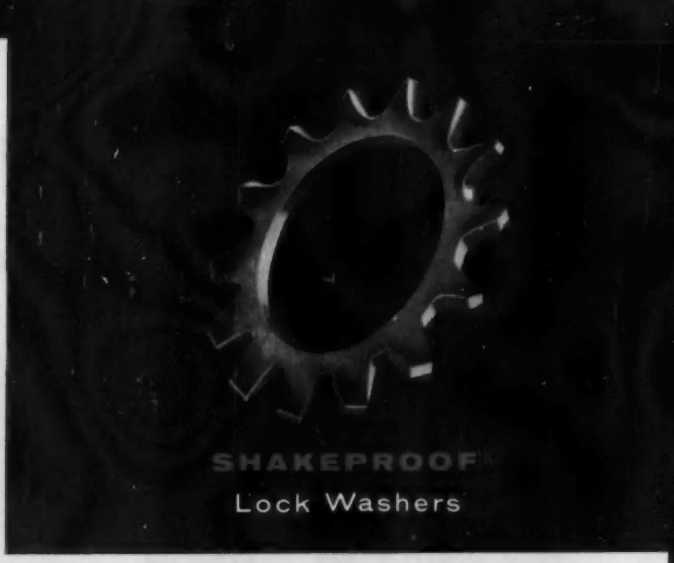
There are obviously many interpretations that can be placed on the mixed character of present business activity, running all the way from the belief that the present situation is the prelude to accelerated decline later this year to the judgment that present sluggishness reflects only minor cor-

(*Turn to page* 106, *please*)

more

Locking Power

...than any other washer or washer substitute





Shakeproof locking teeth can be incorporated into many types of lock washers . . . for added strength, countersunk, and elongated holes, heavy-duty applications and other requirements.

- Shakeproof Lock Washers assure maximum vibration protection for your product
- Exclusive tapered-twisted teeth resist loosening • Assure maximum locking engagement • Form positive brace against rotation • Resist shock
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Send for Shakeproof Lock Washer Sample Kit

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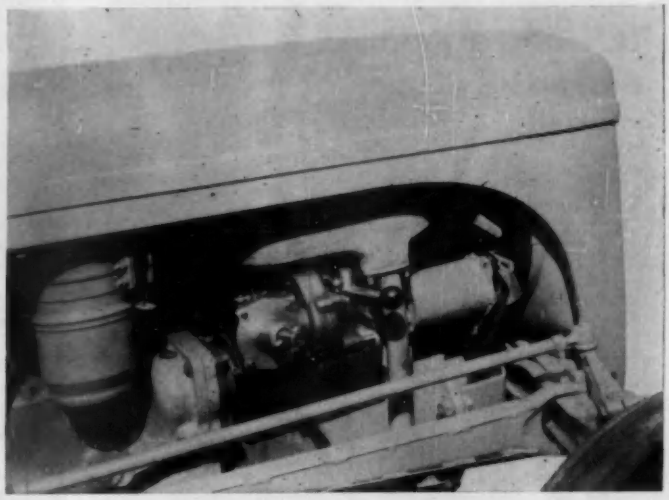
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St. Charles Road, Elgin Illinois • Offices in Principal Cities

In Canada: SHAKEPROOF-FASTEX, Division of Canada Illinois Tools, Ltd., Toronto, Ontario

itw

Inertia Starter for Diesels *developed by* Simms in Britain



Simms inertia starter on Fordson Major tractor, mounted in place of electric motor

AN inertia starter, made in Britain by Simm Motor Units Ltd., is designed for Diesel engines used where hand starting is essential or desirable, such as on earth-moving equipment, emergency generating sets and lifeboats, and in tropical climates where battery maintenance is a major problem. It is fitted in the place of the usual electric motor, and an average man can start the engine by steady cranking at a moderate speed for about ten seconds.

The unit consists of an inertia flywheel which is manually spun up to 8000 rpm through a compound epicyclic gear train. When this speed is reached a centrifugal plunger on the flywheel rim contacts a resilient strip inside the housing and sounds an audible signal. The operator then engages a dog clutch that connects the slowly rotating output shaft of the gearing to a novel variable transmission.

This has two cranks linked together at right angles to each other, and each moving only through 180 degrees. When the dog clutch is engaged, torque is applied to the input crank ("A" in accompanying diagram Fig. 2A, showing the starting positions). Crank A gradually accelerates output crank B from rest, the latter being connected by step-up gearing to the starter pinion. The two cranks finish their strokes as shown in Fig. 2B when flywheel inertia is fully transferred to the engine.

The variable transmission is automatically reset when hand cranking begins again. During the initial 10-second period, the starter pinion engages with the flywheel and the engine is turned over slowly through an auxiliary drive gear in order to prime the injection system. The Simms unit is suitable for engines of up to six cylinders with a volume of about 60 cu in. per cylinder, and weighs 73 lb.

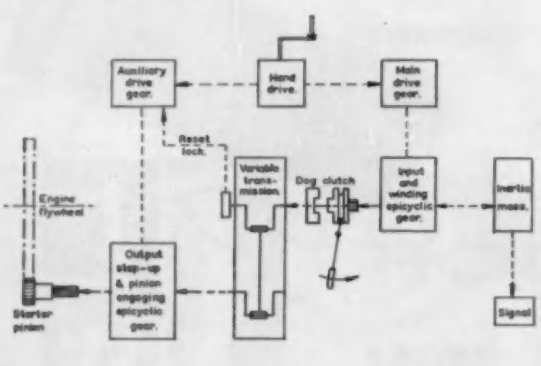


FIG. 1

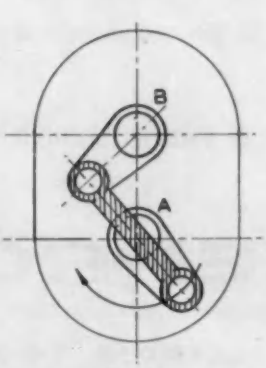


FIG. 2A

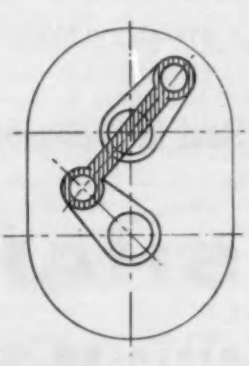


FIG. 2B

Miller

FLUID PRESSURE BOOSTERS



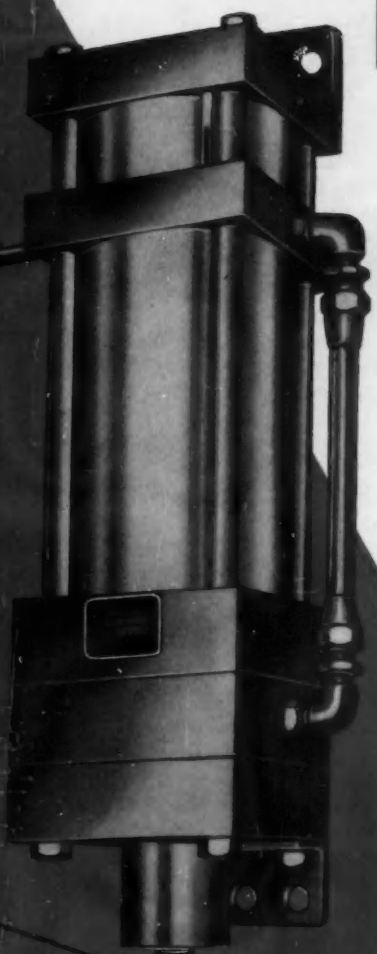
BOOST 80 PSI AIR

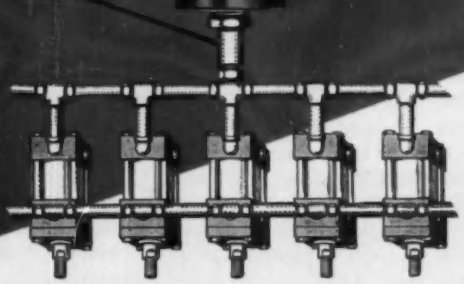
Input Range: 40 to 3000 psi Air or Fluid

TO 2000 PSI HYDRAULIC PRESSURE

Output Range: 200 to 10,000 psi Fluid

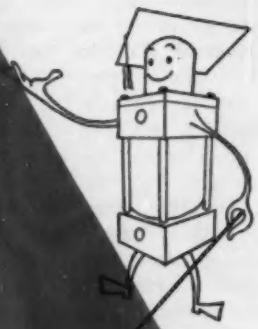






- Save space, weight and investment cost by replacing pump installations in many applications.
- Less costly to install, operate and maintain.
- **Hold Pressure indefinitely** without the motion and heat generation of ordinary pump circuits.
- Provide—at point of cylinder thrust—more efficient power with less weight in less space than direct driven air cylinders.
- Save up to 95% of air consumed by direct driven air cylinders.
- Operate at speeds of 30 to 450 strokes per minute.

NOTE: In addition to its most complete line of "Custom-Built" Boosters available on normal delivery Miller offers 5" bore, 25 to 1 ratio, boosters for immediate delivery in either 6" or 12" stroke. Write for data and prices.



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- **WELDING**
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Other Miller products include: Air cylinders, 1½" to 20" Bores, 200 PSI operation; low pressure hydraulic cylinders, 1½" to 6" bores for 500 PSI operation, 8" to 14" bores for 250 PSI; high pressure hydraulic cylinders, 1½" to 12" bores, 2000-3000 PSI operation. All mounting styles available.

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Miller

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COUNTERBALANCE CYLINDERS

Automotive Subjects Discussed at Annual Convention of the ASQC

MORE than 60 papers on the subject of statistical quality control were presented at the Annual Convention of the American Society for Quality Control (ASQC) in Detroit late in May. Topics covered the entire range of industrial activity, including—automotive, aircraft, metals and chemicals, foundries and press shops, electronics, military, and general. This is intended as a brief news summary of some of the papers of specific interest to our readers.

With the widening use of automation in industry attention must be given to the features of inspection automation, according to W. W. Spencer, General Electric Co. In considering control of automation lines it must be borne in mind that the problem has two parts: process automation and inspection automation or process control automation, the latter being tied in intimately with the process itself. To achieve control, it is necessary to have control of each individual step in the process and rejections should be made at each stage by automatic means.

One of the headaches in applying AQL is in the relationship of the vendor and his customer. Unless the systems of inspection are alike there is trouble. A solution was proposed by J. Mannion, Northrup Aircraft, Inc., in a multipurpose data system. It utilizes variables data submitted by the vendor, variables sampling including a measurement method comparison; and a method of evaluating vendor performance by means of a demerit plan. This includes the handling of data by means of electronic data processing equipment. The author visualizes this as a practical application of variables sampling, yielding a high degree of conformance assurance and an automatic rating of vendor performance.

An illustrated presentation of the influence of automatic process equipment on gaging methods was given by W. S. Tendler, Warner & Swasey Research Co. It covered an appraisal of the requirements of automatic inspection methods for universal automatic machines; and an analysis of the role of automatic gaging of multi-dimensional parts for transfer type equipment. The colored film showed some advanced types of automotive gaging machines, including tape-controlled equipment. The subject of automatic computing as a part of automatic inspection also was covered.

Quality control of automotive electrical system components was discussed by Frank Lynn, Ford Ypsilanti Plant. It dealt with the need for coordinating engineering design standards with manufacturing quality, emphasized that only coordinated effort will make the system work properly. The paper also covered in detail some of the special techniques that have been applied and found useful in organizing quality control.

How far has statistical control been applied to press shop operations? That was the question discussed by Jules Mehalek, The Budd Co. Generally speaking, statistical analysis is used in many press shops but not in the same sense as it is in machine shops. Whether progress can be made in this area to the same extent as in other manufacturing areas is something that depends upon management and its aims, according to the author.

AQL's are only part of the story in setting upon the quality control plan. A paper by E. R. Clark, Detroit Transmission Div., GMC, set out to demonstrate a method for evaluating the selected AQL regardless of how it was originally established. The presentation was aimed mainly at an evaluation of a vendor's performance. It pointed out that in addition to the AQL, there is a criterion of actual quality level, as well as the attainable quality level. These criteria must be weighed and suitable adjustments made to attain consistent results without undue rejections. Finally the author explained that the tightening of AQL's and improving the acceptance plans certainly adds to consumer quality protection. But it may interfere seriously with the consumer's quantity schedule. The acceptance function of any receiving inspection must be coupled with a planned program of correction and prevention of defects if optimum performance is to be realized.

The first report of the Automotive Division Task Force on machine tool capability studies was presented by Brent C. Jacob, Jr., Minneapolis-Moline Co. The ultimate objective of the continuing study is to evaluate the many types of machine tools and obtain a thorough knowledge of their capabilities, i.e., the inherent ability to maintain dimensional accuracy. The Task Force reviewed the approaches to the measurement and interpretation of inherent variability and set down some basic recommendations, including the state of the art. The study recognizes that it is futile to expect better quality control than is inherent in a given machine.

Herbert B. Epstein, Chance Vought Aircraft Corp., described an approach to the application of quality control for aircraft fabrication. It is his feeling that quality control is only one element in a balanced quality control program. It also involves the monitoring of many job shops and suppliers to assure proper quality. But above all, quality control depends upon design considerations and demands complete coordination of engineering and manufacturing functions.

Another paper dealing with vendor performance was presented by W. A. MacCrehan, Jr., Bendix Aviation Corp. It described the application of statistical quality control in a vendor's plant as a means of evaluating quality. This then becomes a yardstick of the ability of a vendor to perform and assists the purchasing department

(*Turn to page* 128, *please*)

The PUSH behind the Sidewinder's Sting!



...A development of Hunter Douglas

Effective at altitudes up to 50,000 feet, the Navy's air-to-air guided missile, SIDEWINDER, is a rugged, sensitive and reliable weapon. Encompassed in its incredibly small 5" diameter and 9'5" length are all necessary propulsion and guiding equipment plus a deadly warhead. Surprisingly, the SIDEWINDER is unusually economical; produced at a cost comparable to a load of aircraft cannon bullets... *an economy resulting directly from Hunter Douglas technical achievements in the field of cold forging!*

The major problems of producing a light, strong motor tube meeting precision tolerances required in this type of propulsion unit were solved by Hunter Douglas. The SIDEWINDER motor tube was produced as a single precision aluminum cold forging integrating the tube and wing supporting channel ring section, eliminating costly assembly operations and alignment difficulties. The tube is typically straight within .020" TIR, I.D. within .006", wall thickness within .0015" and yield strength of 72,000 psi minimum.

Completion of Hunter Douglas experimental cold forging techniques helped pave the way for mass production of the SIDEWINDER. Today, Hunter Douglas is the only successful producer of this complex cold forged component and is the prime contractor to the U.S. Navy, delivering the completely assembled SIDEWINDER motor, ready for final addition of propellant, warhead and guidance unit.

Behind this notable Hunter Douglas achievement stands a strong integrated business structure combining technical resources, manufacturing facilities and the coördinated staff to see all jobs "WELL DONE."

Hunter Douglas Aluminum

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• • INDUSTRY STATISTICS • •

1957 WEEKLY U. S. MOTOR VEHICLE PRODUCTION

As reported by the Automobile Manufacturers Association

Make	Weeks Ending June 1	Weeks Ending May 25	Year to Date 1957	Year to Date 1956
PASSENGER CAR PRODUCTION				
Hudson	47	43	1,177	3,930
Nash	134	168	2,974	10,303
Rambler	1,823	2,291	41,369	43,162
Total—American Motors	2,004	2,494	45,540	57,395
Chrysler	718	3,157	61,201	55,608
De Soto	1,597	2,244	65,747	49,259
Dodge	4,466	7,575	143,431	91,680
Imperial	193	1,099	20,357	*
Plymouth	13,114	16,372	317,884	215,185
Total—Chrysler Corp.	20,110	30,447	608,620	411,732
Ford	23,727	30,457	692,345	600,416
Lincoln and Continental	515	834	21,422	25,136
Mercury	2,726	6,576	153,686	118,197
Total—Ford Motor Company	26,970	37,867	867,453	743,749
Buick	3,637	7,694	211,057	286,336
Cadillac	2,036	3,339	71,642	72,234
Chevrolet	16,931	29,706	665,562	760,623
Oldsmobile	4,345	7,704	196,187	222,364
Pontiac	3,592	6,724	172,405	169,771
Total—General Motors Corp.	32,541	55,169	1,319,453	1,511,328
Packard	6	20	6,045	11,592
Studebaker	768	1,429	26,688	43,050
Total—Studebaker-Packard Corp.	774	1,449	32,733	54,642
Checker Cab	25	46	1,917	1,263
Total—Passenger Cars	82,424	127,472	2,875,716	2,780,109
TRUCK PRODUCTION				
Chevrolet	6,241	6,890	157,839	170,068
G. M. C.	711	1,366	30,335	44,731
Diamond T	95	121	2,041	2,141
Divco	48	80	1,621	1,865
Dodge and Fargo	683	1,510	36,247	38,703
Ford	5,526	7,877	155,961	136,990
International	2,360	2,956	46,660	63,544
Mack	225	329	7,439	8,219
Reo	78	131	1,525	1,608
Studebaker	147	162	5,150	6,778
White	199	332	7,108	8,319
Willys	973	1,515	27,042	26,381
Other Trucks	100	108	2,372	3,680
Total—Trucks	17,396	23,377	481,340	513,027
Buses	64	104	1,893	1,900
Total—Motor Vehicles	99,884	150,953	3,358,949	3,295,036

* Included with Chrysler.

1957 TRUCK TRAILER SHIPMENTS

Type of Trailer	March	February*	Three Months
Vans			
Insulated and refrigerated	389	432	1,083
Steel	63	64	178
Aluminum	326	368	905
Semi-insulated	78	68	234
Steel	10	16	35
Aluminum	68	52	199
Furniture	185	166	520
Steel	165	159	487
Aluminum	20	7	33
All other closed-top	1,861	1,837	5,510
Steel	972	919	2,781
Aluminum	889	918	2,729
Open-top	244	330	897
Steel	157	164	508
Aluminum	87	166	389
Total—Vans	2,757	2,833	8,244
Tanks			
Petroleum	394	451	1,248
All other	126	93	333
Total—Tanks	510	544	1,581
Pole, pipe and logging			
Single axle	33	33	96
Tandem axle	86	38	178
Total	119	71	274
Platforms			
Racks, livestock and stake	189	40	291
Grain bodies	141	166	434
Flats, all types	625	707	1,927
Total—Platforms	955	913	2,652
Low-bed heavy haulers	339	238	776
Dump trailers	166	150	490
All other trailers	301	226	811
Total—Complete Trailers	5,138	4,975	14,828
Chassis	291	258	798
Total—Trailers and Chassis	5,429	5,233	15,626

*—Revised. Source—Industry Div., Bureau of the Census.

1957 TRUCK FACTORY SALES BY G.V.W.

As reported by the Automobile Manufacturers Association

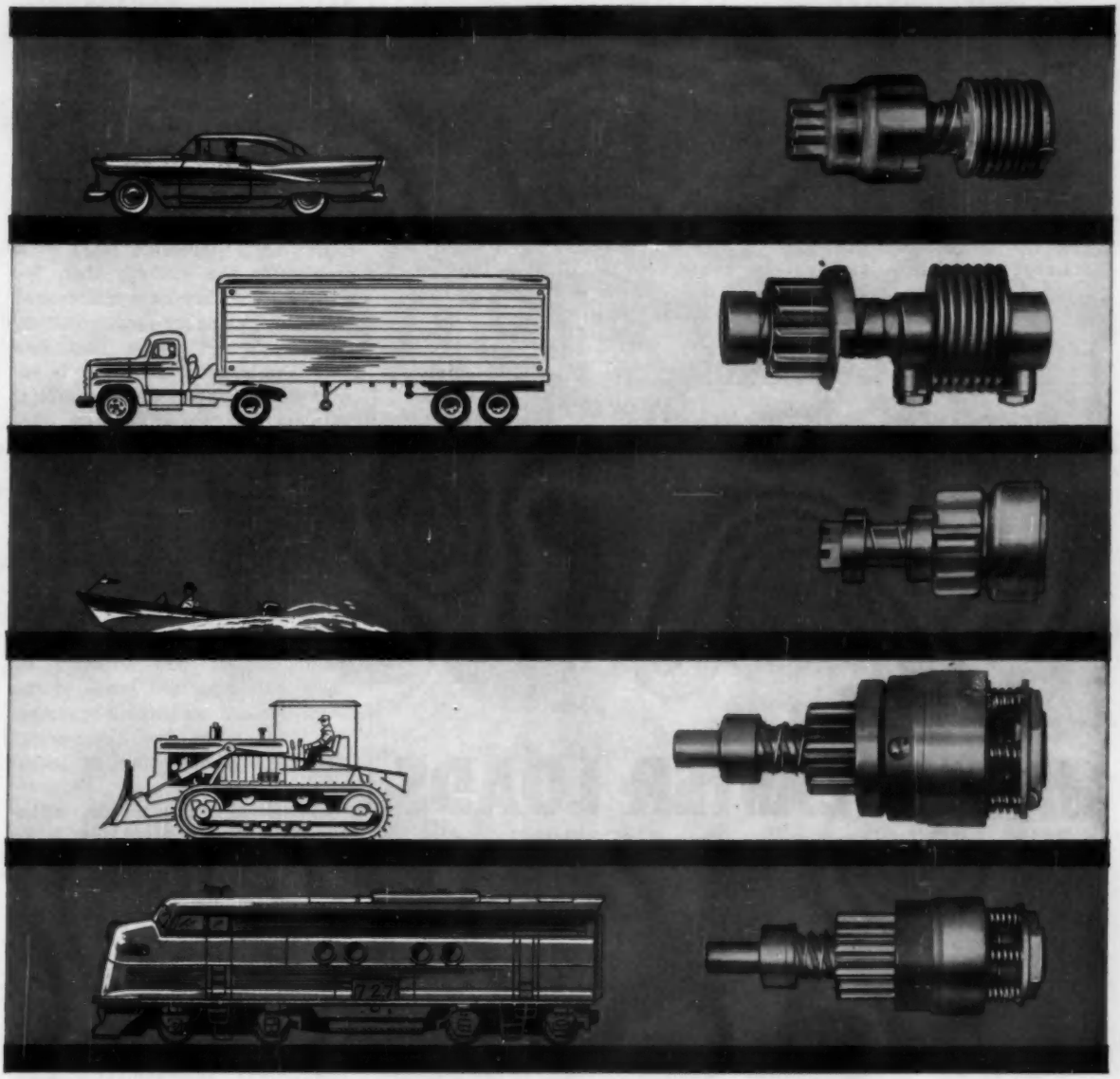
Month	6,000 lb and less	6,001-10,000 lb	10,001-14,000 lb	14,001-16,000 lb	16,001-19,500 lb	19,501-26,000 lb	26,001-33,000 lb	Over 33,000 lb	Total
January	48,186	11,843	2,399	12,478	6,396	3,560	3,360	2,893	91,117
February	45,516	13,537	3,289	13,921	4,994	3,988	3,436	3,066	91,767
March	45,873	13,616	3,469	13,035	5,117	3,985	3,502	3,106	91,793
April	46,899	16,254	3,979	19,127	7,371	4,441	3,656	3,648	105,175
Total—4 Months, 1957	186,274	55,250	13,136	58,561	23,880	15,974	13,954	12,733	379,762
Total—4 Months, 1956	188,057*	72,072*	14,788	75,306	29,682	22,494	29,413	**	408,812

*—Prior to Jan. 1957 vehicles below 10,001 G.V.W. were grouped "5,000 & less" and "5,001-10,000 lb." **—Included with 26,001-33,000 group.

REGIONAL SALES OF NEW PASSENGER CARS

Zone	Region	March 1957	February 1957	March 1956	Three Months 1957	Three Months 1956	Per Cent Change: Mar. over February	Mar. over Mar. 1956	Three Months 1957 over 1956
1	New England	26,592	20,883	26,776	67,041	75,025	+27.34	— .69	—10.64
2	Middle Atlantic	123,723	69,046	103,350	257,663	233,857	+79.19	+19.71	+10.18
3	South Atlantic	67,594	60,569	64,695	191,536	185,304	+11.60	+ 4.48	+ 3.36
4	East North Central	141,045	115,404	141,370	389,744	372,139	+22.22	— .23	— .64
5	East South Central	26,490	23,225	30,659	70,060	77,618	+14.06	—13.60	— 8.96
6	West North Central	51,677	38,107	46,095	129,471	124,520	+43.12	+12.11	+ 1.57
7	West South Central	47,516	44,735	50,525	139,493	138,910	+ 6.22	— 5.96	+ .42
8	Mountain	16,783	15,556	18,246	46,141	46,197	+ 7.87	— 8.02	— .12
9	Pacific	71,497	53,198	63,518	180,213	170,854	+34.40	+12.56	+ 5.48
	Total—United States	572,917	438,725	545,234	1,448,962	1,424,424	+30.59	+ 5.08	+ 1.72

States comprising the various regions are: Zone 1—Conn., Me., Mass., N. H., R. I., Vt. Zone 2—N. J., N. Y., Pa. Zone 3—Del., D. of C., Fla., Ga., Md., N. C., S. C., Va., W. Va. Zone 4—Ill., Ind., Mich., Ohio, Wis. Zone 5—Ala., Ky., Miss., Tenn. Zone 6—Iowa, Kan., Minn., Mo., Neb., N. D., S. D. Zone 7—Ark., La., Okla., Tex. Zone 8—Ariz., Colo., Ida., Mont., Nev., N. M., Utah, Wyo. Zone 9—Cal., Ore., Wash.



BIG OR SMALL . . . BENDIX DRIVES START THEM ALL

Throughout the world of transportation it's an accepted fact that *you start with Bendix!* And it's not surprising. Bendix* Starter Drives have been synonymous with dependability for fifty years in the automotive field. They've proved themselves just as reliable on submarines, aircraft, earth movers, outboard motors, helicopters. In fact, every type of internal-combustion engine ever built has used a Bendix Starter Drive. Hospitals use Bendix Drives to activate their stand-by equipment. Air raid sirens across the country are started with Bendix Drives. It's logical to believe that such universal acceptance indicates a standard of quality which no other manufacturer has been able to match. Need we say more?

*REG. U. S. PAT. OFF.

Bendix-Elmira, N.Y.
ECLIPSE MACHINE DIVISION

Bendix
AVIATION CORPORATION

BUSINESS PULSE

(*Continued from page* 98)

rective tendencies which will shortly give way to a resumed uptrend. The fact is that many of the numerous possible interpretations can be argued with considerable merit. Moreover, this uncertainty may well persist until after Labor Day, since the economy is now approaching the period of summer lull, during which it will be especially difficult to discern underlying trends.

Confidence in Outlook Is Strong

Despite this uncertainty, it is interesting that confidence seems to be generally stronger than it was at the beginning of the year. Strength persisted in stock prices throughout May, with the Dow-Jones industrial average rising above the 500 mark, more than 40 points above its February low. And bond yields have been maintained at comparatively high levels, strengthening the conviction that bond buyers are thinking in terms of further extension of favorable business levels accompanied by a substantial continuing demand for loanable funds. Federal Reserve authorities, for their part, apparently continue to believe that inflation still represents more of a problem in the economy than deflation, since they have maintained relatively stringent credit policies.

One of the things that has helped to buttress sentiment in recent weeks is evidence from official sources that the squeeze on corporate profits is abating somewhat.

According to preliminary estimates made by the Council of Economic Advisers, aggregate corporate profits before taxes ran at a seasonally adjusted annual rate of $46½ billion in the first quarter of 1957. This was approximately the same as in the final quarter of 1956, and it was substantially above the depressed levels of the first, second, and third quarters of 1956, when the "cost-price" squeeze was operating so intensively.

Admittedly, this profits situation still leaves something to be desired, in the sense that, even with the recent recovery, profits are still no higher than they were at the end of 1955. And actually in terms of purchasing power they are somewhat lower, inasmuch as prices have since risen. This is far from an impressive record when one considers that all other components of national income, except the rental income of persons, are significantly higher now.

Even with these qualifications, however, there is justification for the contention that the pressure on profits has eased somewhat, certainly in the sense that it has not become as acute as had been feared earlier. Businessmen have been able (in considerable measure, apparently, because of cost economies) to reverse the very unfavorable profits trend of early 1956, and this encourages the hope that they may be able to achieve additional progress in the future. This in turn suggests that capital outlays may be well maintained in the latter part of this year and into 1958.



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LIGHTER WEIGHT—SHALLOWER

SMOOTHER, QUIETER OPERATION

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ARCH TYPE CONSTRUCTION FOR BETTER VENTILATION

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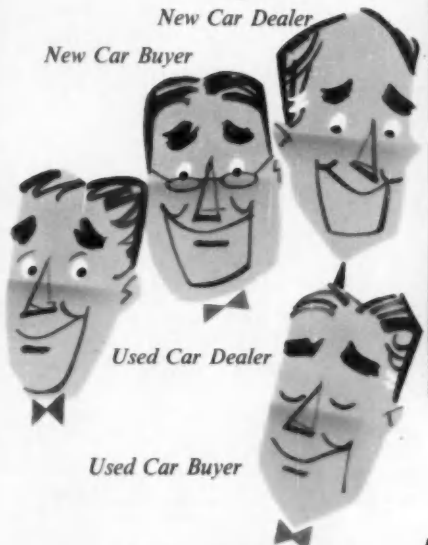
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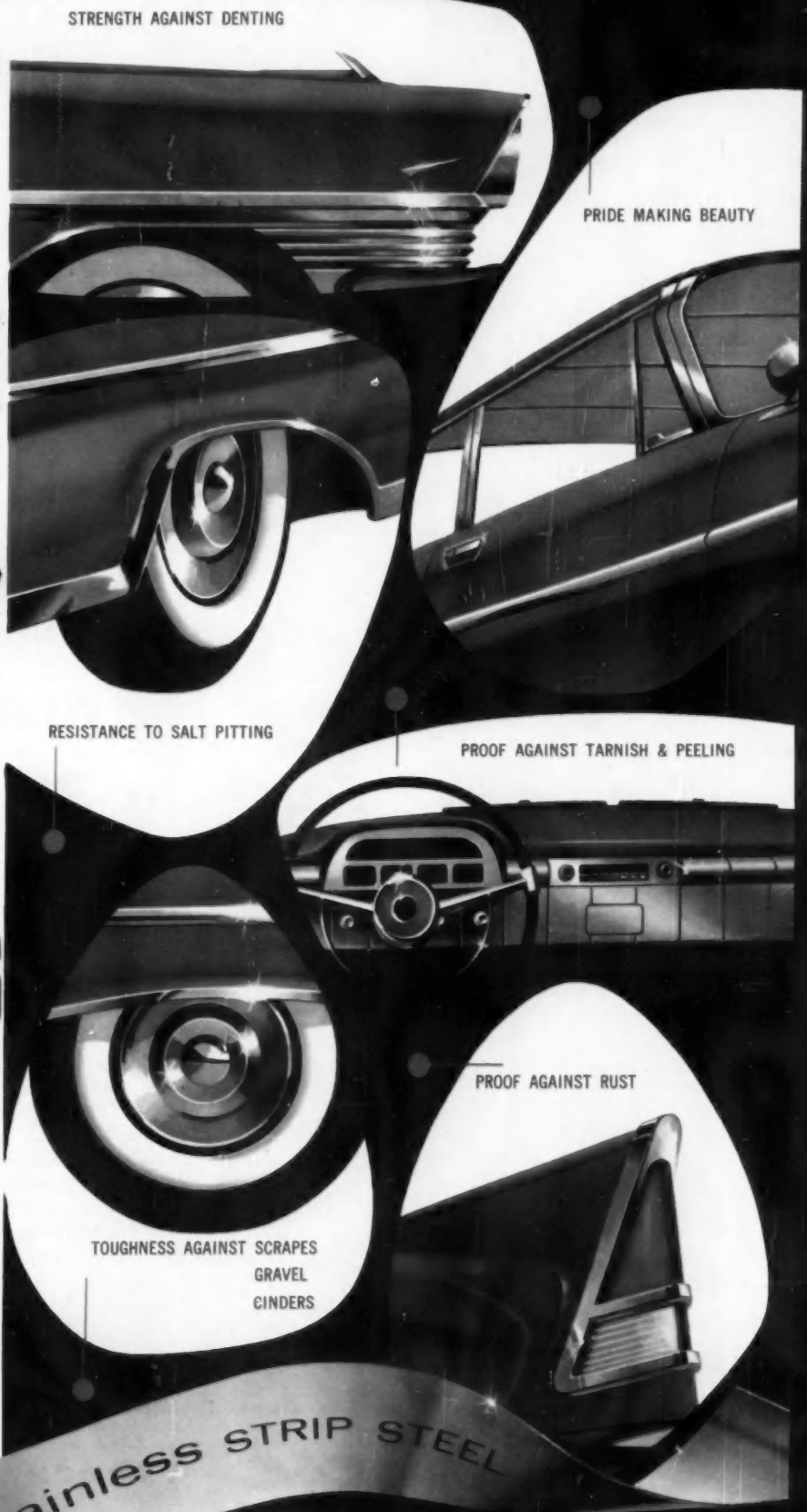
EXPORT SALES: Borg-Warner International, 36 S. Wabash Ave., Chicago 3, Illinois

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On the showroom floor—on the highway—in and out of the used car lot—all the way to the ultimate owner, *stainless steel* pleases everyone! Stainless keeps selling itself because it's *the metal that does not deteriorate.* Always bright. Always beautiful. So easy to care for. *So satisfying to find on your car.*



Superior Stainless STRIP STEEL

Superior Steel
CORPORATION
CARNEGIE, PENNSYLVANIA



ask Firestone—

When the pressure is on, Fortisan-36 rayon is it!

Firestone Industrial Products had this headache. New automobiles required higher pressure in cooling systems. What reinforcing yarn could best add strength to radiator knitted hoses—without increasing yarn size? The rewarding answer was Fortisan-36.

Indeed the tensile strength of this remarkable new Celanese fiber is so high that smaller yarn could be used—improving the appearance of the hose while reducing knitting costs.

Fortisan-36's unique properties contribute to the processing and performance of knitted hose as no other yarn can. Unaffected by moisture change or high auto temperatures, it neither shrinks nor stretches—assuring unique quality control in both processing and application of the hose.

Equally important—Celanese supplies not only its yarns but its skills as well—from product development in our plants to technical assistance in yours.

Celanese Corporation of America, Industrial Sales Department, Textile Division, Charlotte, North Carolina. Celanese®

District Offices
180 Madison Ave., New York 16, N. Y. • 22 W. Madison St., Chicago 2, Ill.
Export
Amcel Co., Inc. and Pan Amcel Co., Inc. • 180 Madison Ave., New York 16
In Canada
Chemcell, Canadian Chemical Cellulose Co., Ltd. • 2035 Guy St., Montreal, P.Q.

Celanese Fibers for Industry

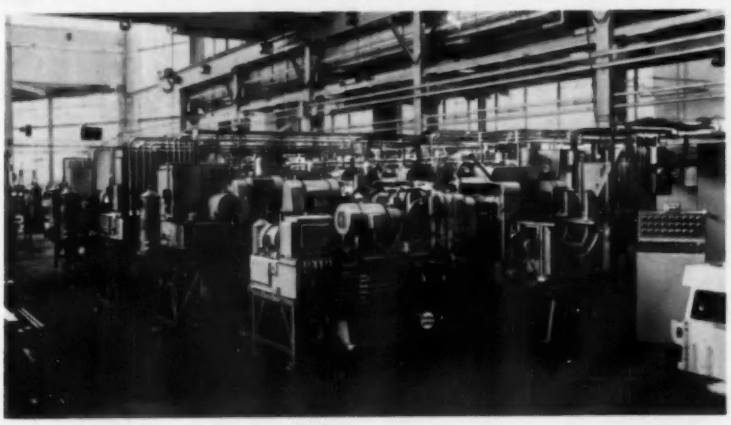
FORTISAN® RAYON • FORTISAN®-36 RAYON • ARNEL® TRIACETATE • RESILUCEL T.M. • ACETATE • VISCOSE RAYON

Another Manufacturer Chooses G-E Control For Automotive Industry Machines



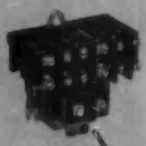
The panel above is part of a control system containing 356 General Electric machine tool relays and 46 G-E motor starters. These G-E devices help control the operation of an automobile cylinder block transfer drilling and tapping machine built by W. F. & John Barnes Company of Rockford, Illinois. This machine will be installed at the Ford Motor Company's Cleveland, Ohio Engine Plant.

Speaking of the panel, Nelson P. Bashor, Director of Electrical Controls, W. F. & John Barnes Company, says, "We recognize the product leadership that has been established by the General Electric machine tool relay. We are proud to use it in our electrical control panels, and are confident that our customers will obtain the best operation from this equipment."



This machine, consisting of 33 sectional progress stations, performs numerous drilling and reaming operations and can handle 103 automobile cylinder blocks an hour. For a more detailed description of General Electric control devices used by W. F. & John Barnes Company in the control panel for this machine, turn the page.

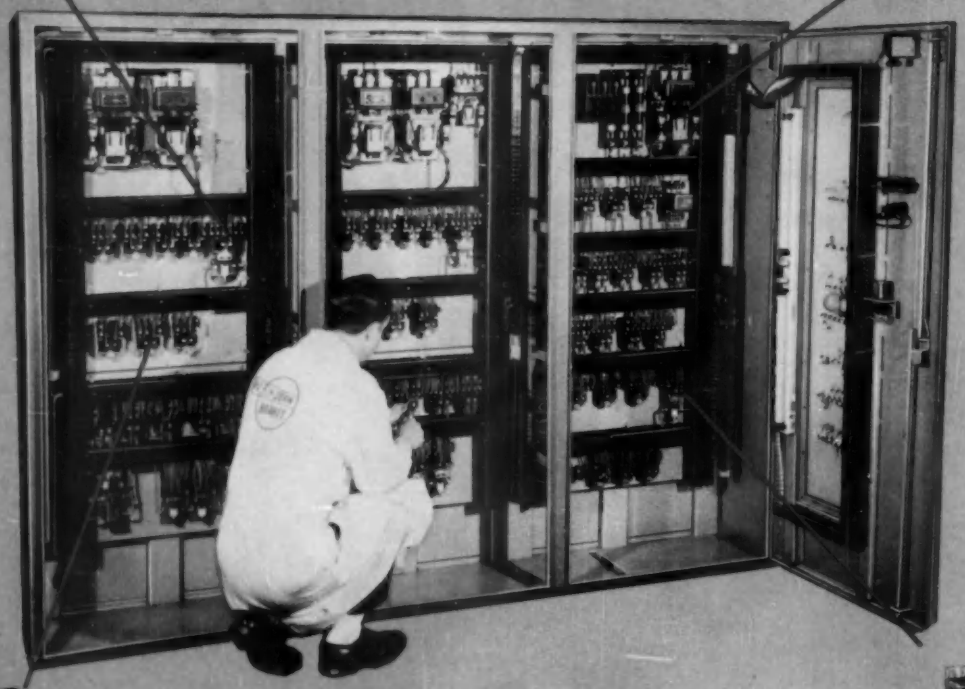
GENERAL ELECTRIC



6-POLE IN-LINE machine tool relays save space because they can be mounted closer together and have front accessibility.

MAGNETIC STARTERS are offered in NEMA Sizes 0–5, have bi-metallic overload relays for dependable overload protection.







MACHINE TOOL RELAYS have Strongbox coils and fine silver contacts for longer life. Available in 2- through 12-pole forms.

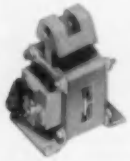
LATCHED-IN RELAYS compact and easy to wire provide continuity of sequencing in case of voltage dip or power interruption.



G-E Controls for the Automotive Industry



OIL-TIGHT PUSH BUTTONS feature self-aline contacts that last twice as long by actual load-life tests. They are offered in a wide variety of interchangeable operators.



STRONGBOX SOLENOIDS have coils sealed against the entrance of oil, dust, and moisture. They are available in a full range of ratings in both push and pull forms.



PNEUMATIC TIME-DELAY RELAY has range of settings from 0.2 to 180 seconds. It can be changed from on delay to off delay without additional parts or special tools.

W. F. & John Barnes Company selected General Electric machine tool relays and motor starters for three reasons: 1) ease of installation; 2) high operating efficiency; 3) dependable operation. These G-E controls are built to JIC Standards, and are designed for the rugged service required for automotive applications.

Whether for use on machines in your own plant or on equipment bought from suppliers, specify General Electric control. Your nearest General Electric Apparatus Sales Office or Distributor has full information for you. For a copy of GEA-6317, "G-E Control for JIC Standards," write to Advertising Section 733-36, General Electric Company, Bloomington, Ill.

GENERAL ELECTRIC

Gulf's New Laboratory

(*Continued from page* 54)

Warning lights signal any breakdown in the operating schedule, and indicate what is wrong.

The chassis dynamometer permits testing petroleum products ranging from fuels, to wheel bearing greases, to transmission lubricants, all at one time under the stresses of actual driving. Two smaller cold cells for individual engine testing are also provided. All are serviced by a York refrigeration unit, with Freon compressors totaling 350 hp.

Test cell engines include conventional and modified automotive engines, outboard models, Diesels, gas turbines, fuel injection systems, and single-cylinder research units. In several rooms, radioactive piston rings measure the wear produced in an engine with various fuels and lubricants. In another, tape recordings are taken of engine knock as a permanent record of fuel performance.

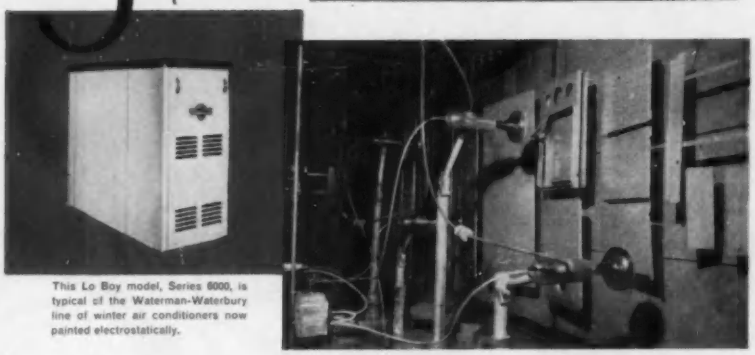
The fuel source for the cells, the Blending Building, pumps in gasoline from the 26 tanks in the tank farm, each of which holds separate fuel blends. At a distribution panel, resembling a telephone switchboard, any one of these tanks can be connected so as to furnish a particular fuel to a particular test cell. Where only a drum of fuel is required, it is wheeled directly outside the test cell and connected to a special fuel line and pump leading to each engine.

The Blending Building also contains rooms for blending tetraethyl lead and other additives into fuels, drum storage, and drum cleaning.

BOOKS . . .

SAE AERONAUTICAL DRAFTING MANUAL, *published by Society of Automotive Engineers, Inc., 485 Lexington Ave., New York 17, N. Y. Price, $5.00.* The seventh edition of this manual has new or revised material on the following subjects: applied surface finishes; unified and American screw threads; flat pattern development; drawing revisions; hairspring dimensioning; tolerancing methods. Authored by some of the nation's leading industrial aeronautical drafting technical experts, this book can be used as a practical reference guide not only by industry, but also in colleges and universities.

3 times as many Furnace Casings per gallon of paint with RANSBURG NO. 2 PROCESS!



This Lo Boy model, Series 6000, is typical of the Waterman-Waterbury line of winter air conditioners now painted electrostatically.

Quality of work is improved; Labor costs are cut and Production Stepped up 150% with

RANSBURG Electrostatic Spray Painting

Results exceeded expectations when Waterman-Waterbury, Minneapolis, modernized their finishing department and went from hand spray to Ransburg No. 2 Process in painting their quality line of heating and air conditioning equipment.

By the former hand spray method, W-W used a half gallon of paint to coat a single casing. Now, with Ransburg No. 2, they get SIX CASINGS PER GALLON . . . or 3 times as many per gallon. Furnace casings, as well as other painted parts which go into the famous Waterbury Furnaces, now get a uniform coating of .8-mil.

Production was increased, too, as automatic painting enabled them to step up the conveyor speed from 7 fpm to 11½ fpm. Where they formerly turned out a complete furnace in five minutes, NOW they assemble three in just six minutes . . . an increase of 150%. All in all, they figure the modernization program—with Electro-Coating—saved over $11,000 in the first three months of operation.

NO REASON WHY YOU CAN'T DO IT TOO!

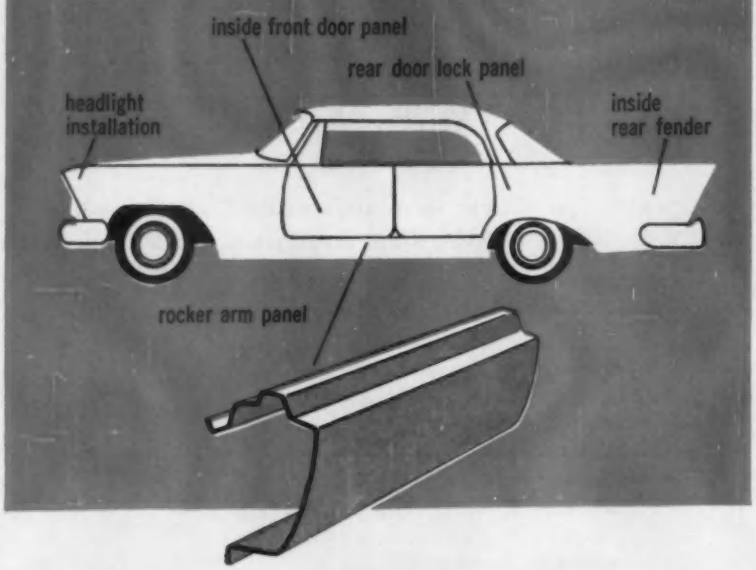
Whatever you paint, we'd like to tell you more about the efficiencies and worthwhile savings which can be yours with Ransburg Electro-Coating Processes. Get our No. 2 Process brochure which cites many on-the-job examples of electrostatic spray painting on a wide variety of products. Or, we'll be happy to loan you our new film, "The Big Attraction" which tells the electrostatic spray painting story in sound and full color.

Call or write

RANSBURG
Electro-Coating Corp.
Barth and Sanders, Indianapolis 7, Indiana

NOW! a weldable corrosion-resistant coating

Zincilate 400



IT'S NEW! Zincilate 400 was used first by the automotive industry on the late 1956 models.

IT'S PROVED! Zincilate 400 is now being used by more manufacturers, in more crucial areas, on the 1957 models.

IT'S EXCLUSIVE! Only Zincilate 400 can be applied before fabrication, then welded, minutes or months after application. You'll get fast, clean work — anytime — when you weld over a Zincilate 400 coating, because it retains its conductivity and contains no chemicals to contaminate electrodes. And, note this — Zincilate 400 provides galvanic protection, even at the point of burn-off, that keeps corrosion shackled.

You can use Zincilate 400 on your product, applying it as the automotive people do, by spray, brush or dip, before fabrication and welding. Your product, if it's made of metal, will be protected — always — by Zincilate 400.

Cost? You'll find many coatings with a lower first cost. But overall costs, where it really counts, are lowest when you're using Zincilate 400. If you'll outline your problem, we'll be happy to tell you just what you can expect of Zincilate 400—and there's no obligation.

Zincilate

CORROSION-RESISTANT, ABRASION-RESISTANT, WELDABLE, AIR-DRIED and BAKED PROTECTIVE COATINGS

INDUSTRIAL METAL PROTECTIVES, INC., 403 HOMESTEAD AVE., DAYTON 8, OHIO

Water Pump Impellers

(*Continued from page* 52)

The press itself, made by Baker Bros., Inc., is rated at 450 tons. It weighs about 60,000 lb, has a stroke of 24 in., with a daylight height of 42 in. with the fixed head. Platen area is 36 in. by 42 in. Overall height is about 16 ft. Closure speeds range from 10.6 to 400 ipm. To provide maximum floor space on all sides of the press, the sump is carried overhead.

All operations of the press are controlled through Westinghouse Cypak controls, used here for the first time on plastics molding presses.

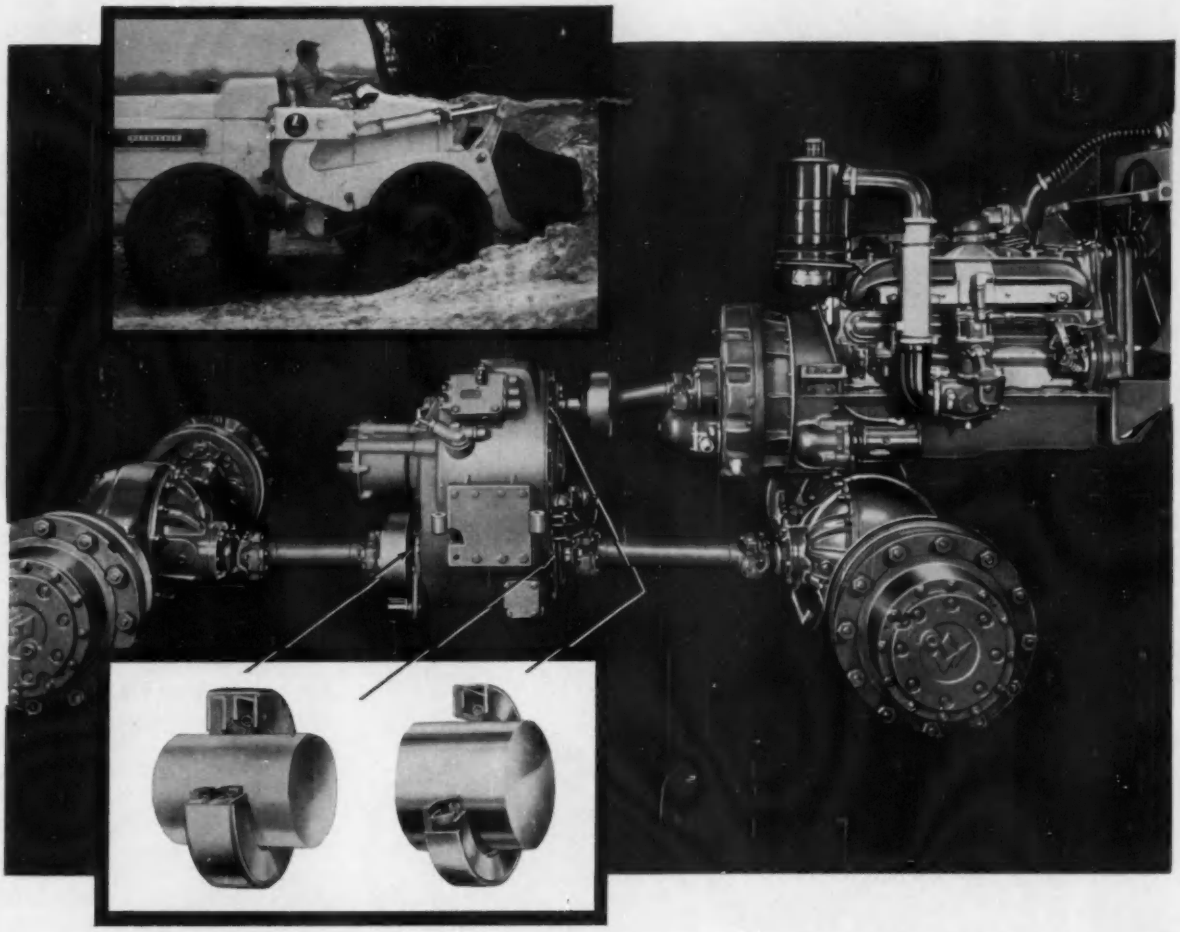
Loading the mold, closing the press, breathing the mold, deceleration, opening, flash cleaning, and ejection of pieces are completely automatic, and the movements of the ram are adjustable as to sequence order and speed.

Ford Motor Co. uses similar automatic presses on its distributor cap production, but these presses are smaller in size.

BOOKS . . .

PRACTICAL AUTOMATION, *by L. R. Bittel, M. G. Melden, and R. S. Rice, published by McGraw-Hill Book Co., Inc., 330 West 42 St., New York 36, N. Y. Price, $7.50.* A practical guide to automation, this book explains how engineers and managers can increase productivity, cut operating costs, and improve safety and working conditions. It discusses the problems that may be encountered when automation is installed, how to combine machines and equipment already in the shop, the application of feedback control, purchasing new tools, maintenance problems, and the "rethinking" of the entire manufacturing operation. The authors give a number of examples of successful installations of automation in plants of various sizes in different industries. In addition, they outline ways in which small plants can be automated.

PUBLIC RELATIONS IDEAS IN ACTION, *edited by Allen H. Center, published by McGraw-Hill Book Co., Inc., 330 W. 42 St., New York 36, N. Y. Price, $5.00.* This volume contains more than 500 tested public relations ideas that can be used for industrial, commercial, professional, or non-profit purposes. In five sections, representing the primary target publics, the editor presents in detail some 50 actual successful projects, described by the men who originated and carried them out. In addition, over 450 other projects are reported in brief form. All these projects were aimed at such diverse groups as employees, investors, consumers, and the general public. The book has an excellent index.



Keeps a workhorse working!

C/R lifeguards the power-shifted transmission in the big Hough "Payloader"

The new Hough Model HH "Payloader" is a big, tough tractor-shovel that wades through hard, rugged work day after day without flinching. Its power-shifted transmission makes it one of the fastest-maneuvering, easiest-handling tractor-shovels on rubber. To keep the transmission humming, two shafts must be protected: an input shaft turning up to 2,200 r.p.m., and an output shaft operating at speeds up to 3,000 r.p.m. All vital parts of the transmission are pressure-lubricated—the SAE 10 HD oil *must* be retained; dirt and grit *must* be excluded. C/R Type P and F Oil Seals with the Conpor K-400 sealing elements . . . specified by Hough engineers . . . have been performing with complete dependability well beyond the required 2,000-hour service life.

If you have similar problems involving lubricant retention or dirt exclusion, C/R Oil Seal engineers can help you. They'll select the correct seal for your application or gladly cooperate with you on special designs.

More automobiles, farm and industrial machines rely on C/R Oil Seals than on any similar sealing device.

CHICAGO RAWHIDE MANUFACTURING COMPANY
1205 Elston Avenue Chicago 22, Illinois

Offices in 55 principal cities. See your telephone book.

In Canada: Manufactured and Distributed by Chicago Rawhide Mfg. Co. of Canada, Ltd., Hamilton, Ontario

Export Sales: Geon International Corp., Great Neck, New York.

OIL SEAL C/R DIVISION
CHICAGO RAWHIDE

OTHER C/R PRODUCTS: Sirvene (synthetic rubber) molded pliable parts • Sirvin-Conpor mechanical leather cups, packings, boots • C/R Non-metallic Gears

Application and Results of Value Analysis

(*Continued from page* 69)

Engine Department. It is actually a supplement to this program. It is a tool to assist the buyers, planners, manufacturing personnel, and engineers in realizing their cost reduction objectives.

As a staff rather than a line organization, value analysis does not claim formal cost reduction credit for savings realized through value analysis proposals. This formal credit is reported by the unit or individual who has taken the action to incorporate the recommended value improvement.

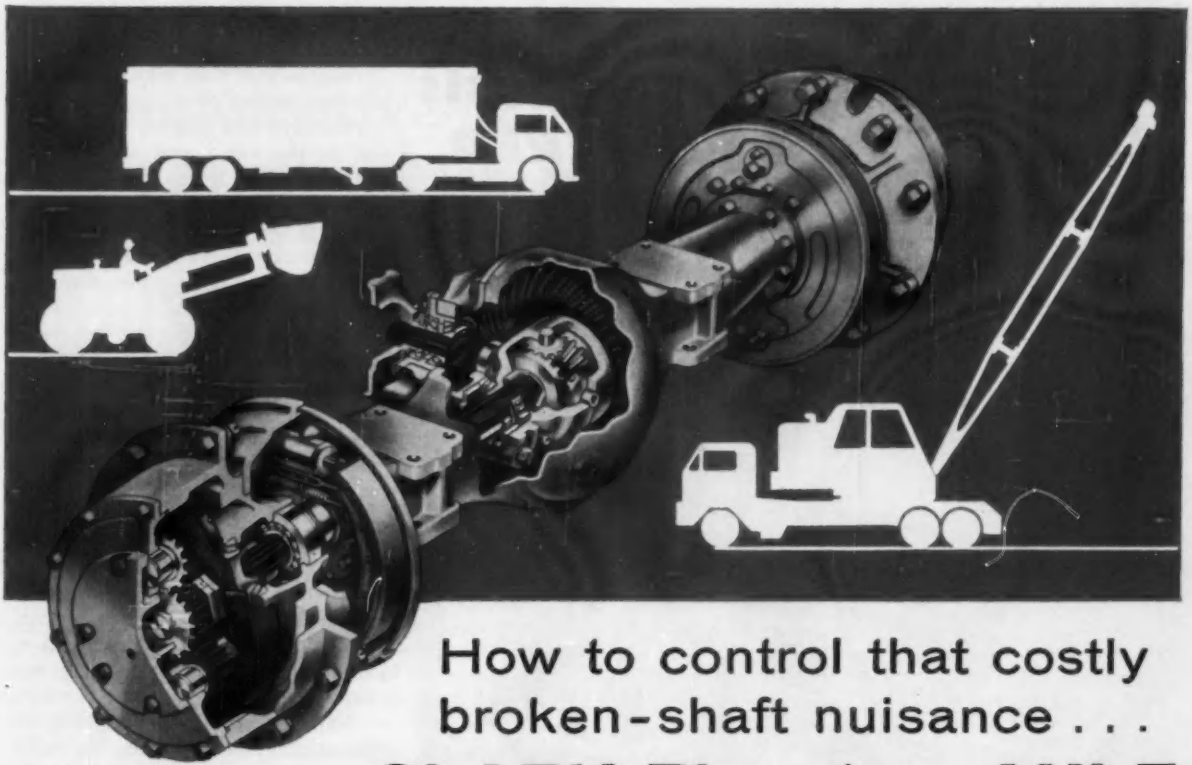
The results of a value analysis project are issued to the responsible management in the form of a recommendation, called a proposal sheet. It is not mandatory that they accept the changes proposed by value analysis. All the necessary facts and figures on which the suggested cost saving has been based are supplied to the person or persons who must make the final decision for incorporation. They examine the recommendation, and based on their best judgement take the action they feel necessary. In this manner full-cooperation of everyone affected by the recommendation is obtained, and functional authority is not affected.

Smooth teamwork with the various units within the department is of critical importance to the success of value analysis.

As a staff function, value analysis is a service group, and a large portion of the work it performs is done at the request of responsible management. Request projects are encouraged as much as possible, because it has been noted that, due to the immediate cooperation which is received, less time is required to complete these projects. This results in a greater savings realized for total man hours spent. They also serve to cement better relations between value analysis and the requesting units.

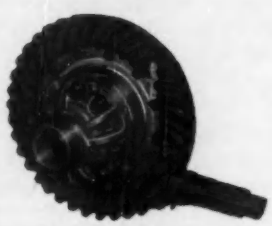
The value analysis unit, in addition to its project work, is also quite active in the instruction of personnel in the philosophy, principles, and techniques of value analysis. Talks are given to training classes in courses such as the General Electric Manufacturing Training Program, Creative Engineering Course, and Apprentice Training Program. This training instills in these personnel the cost consciousness and basic knowledge of Value Analysis which will enable them to improve their job performance. Specialty processes and cost saving methods are also presented to the plant personnel in the form of vendor lectures and movies. These presentations help apprise engineering and manufacturing personnel of the latest methods and techniques of production and provide a better understanding of



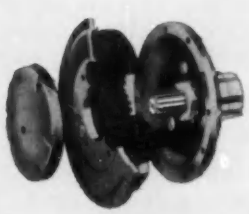


How to control that costly broken-shaft nuisance . . .

CLARK Planetary AXLE



Primary Reduction in the center section, by helical bevel pinion and gear.



Second Reduction in the drive wheel —a sun gear splined to the axle shaft and three planet gears driving an internal gear in the inner periphery of the wheel, as close as possible to the point where tractive effort is applied.

Two types: steering and non-steering.

Check the extraordinary record of performance established by this axle —in the toughest service any axle is required to meet:

- **Excavator Cranes**
- **Tractor-Shovels, Bulldozers, other construction machines**
- **Heavy Duty Trucks for highway and off-highway operations**
- **Tandem-Drive Units for all applications**

Here's a simple engineering idea that hit the jack-pot in spectacular fashion—the Clark Planetary Drive Axle. File these startling facts in your mind:

Reduced torque load on shafts—Putting the planetary assembly (the final reduction) in the drive-wheel hub, takes 70 per cent of the torque load *off the axle shafts*. Result: shaft wind-up and surge virtually eliminated—and *broken axle shafts practically unknown!*

Less weight—yet stronger—an astonishing fact: severest torque loads, typical of extreme off-highway service are handled easily by gears and shafts smaller in size and therefore considerably lighter in weight than conventionally designed axles of equal capacity.

Road speeds up to 30 mph—an outstanding combination of rugged power characteristics plus highway speeds up to 30 mph for job-to-job travel —a big and vital saving.

Special for truck operators—faced with extremely difficult hauling conditions, truck owners have converted regular units to 4-wheel drive by installing two Clark Planetary axles (with Clark Torque Converter and Clark Transmission)—*with complete success.*

Don't fail to get the facts about this revolutionary solution to numerous problems. The coupon will get those facts to you—immediately.

CLARK® EQUIPMENT

CLARK EQUIPMENT COMPANY • AXLE DIVISION, Buchanan 2, Michigan

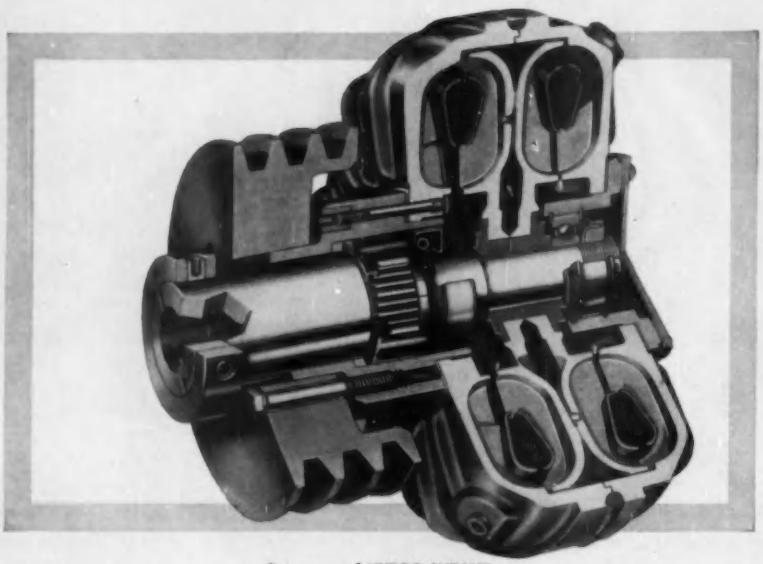
Please send illustrated bulletin on the Clark Planetary Axle.

NAME_____ POSITION_____

FIRM_____ ADDRESS_____

CITY_____ STATE_____

Here's why machinery lasts longer *WHEN POWERED THROUGH FLUID*



Cut-away of HYDRO-SHEAVE

Wherever you find shock loads, torsional stresses or vibrations, you can bet both driving and driven equipment will show undue wear.

That is, *unless the power is transmitted through fluid!*

With Twin Disc Fluid Couplings and HYDRO-SHEAVE® Drives, there are no mechanical connections between driving and driven equipment . . . no metal-to-metal contact to transmit destructive shocks and vibrations. These, instead, are absorbed in the fluid—not in your machinery's expensive components.

But that's not all. Twin Disc Fluid Couplings and HYDRO-SHEAVE Drives offer such advantages as—

1. **Reduce motor starting current demands . . . provide smooth, fast acceleration . . . and often improve over-all power factor.**
2. **Protect against overloads, stalling and motor burn-outs.**
3. **Transmit full input torque at all output speeds.**
4. **Permit motor selection based on running rather than starting load.**
5. **Are engineered as a "package" . . . can be installed in minutes on any standard keyed shaft.**
6. **Because of fluid connection, *cannot* wedge or "freeze" internally.**

Twin Disc HYDRO-SHEAVE Drives—¾ to 50 horsepower; Fluid Couplings—¾ to 850 horsepower.

TWIN DISC

TWIN DISC

Friction Clutches and Fluid Drives

TWIN DISC CLUTCH COMPANY, Racine, Wisconsin • HYDRAULIC DIVISION, Rockford, Illinois

Branches or Sales Engineering Offices: Cleveland • Dallas • Detroit • Los Angeles • Newark • New Orleans • Tulsa

current methods, processes and materials, so that they may be used to the best advantages.

The type and balance of personnel in the value analysis unit of Assembly and Spare Parts is important to its success. At the present time, the Unit has (excluding the supervisor) five value analysis engineers and three value analysis specialists. The value analysis engineers are graduate professional engineers who, by experience and background, have a full understanding of manufacturing processes. The value analysis specialists are men with training or background in purchasing, production, manufacturing, planning methods and practices. With this variety of abilities and knowledge, it is possible to cover a wide range of projects in all phases of engineering, manufacturing, and purchasing with a minimum of familiarization required within the group.

Value analysis is not a group or committee effort. A value analysis project is usually a highly individual effort by the engineer or specialist conducting the analysis. He must be able to conduct a full program of investigation, solution, and incorporation of the value problem, coordinating the efforts of all line personnel who are required to incorporate a change. On some occasions, where a project is very complex and far reaching, or requires a great deal of contacts and study, a team of two men handle a project. The two man team has been found very effective on specific projects, but larger teams have proven to be much less successful.

Value Analysis in Defense Products Vs Consumer Products

The application of value analysis on turbojet engines differs somewhat from its application on consumer products. This is due to the relatively high technical complexity of the engine and the great amount of importance which is placed on engine reliability. As a result, emphasis is placed on the engineering aspects of a value analysis project.

Because of this emphasis, the majority of assembly and spare parts value analysis personnel are graduate engineers. It is important

specialized, stylized, modernized for automotive and appliance industries

THE LATEST WORD IN ADJUSTABLE BED PRESSES

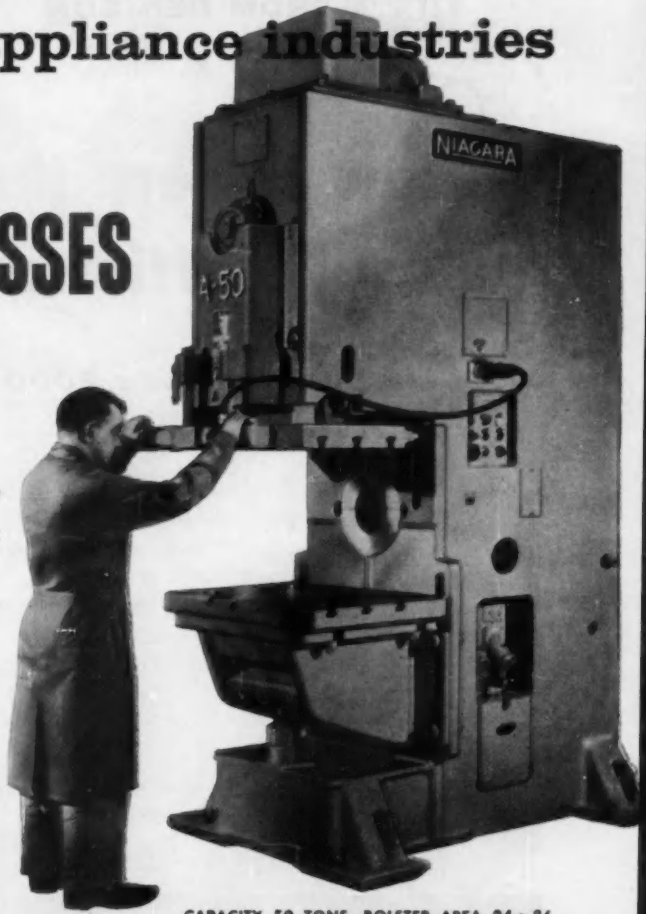
Trim, compact and versatile — this is Niagara's brand new version of its Adjustable Bed Press for the mass production industries. Designed for secondary operations between automated presses in the production line, it embodies specialized features for automotive and appliance manufacturers.

Everything about this press is geared to promote faster, safer and more efficient operation . . . the smooth streamlined exterior of its modern front-to-back crankshaft design . . . absence of overhanging and protruding parts . . . complete drive (gears, flywheel, air friction clutch and brake) fully enclosed within frame . . . up-to-the-minute controls and devices neatly recessed in the frame or completely housed behind flush panel doors.

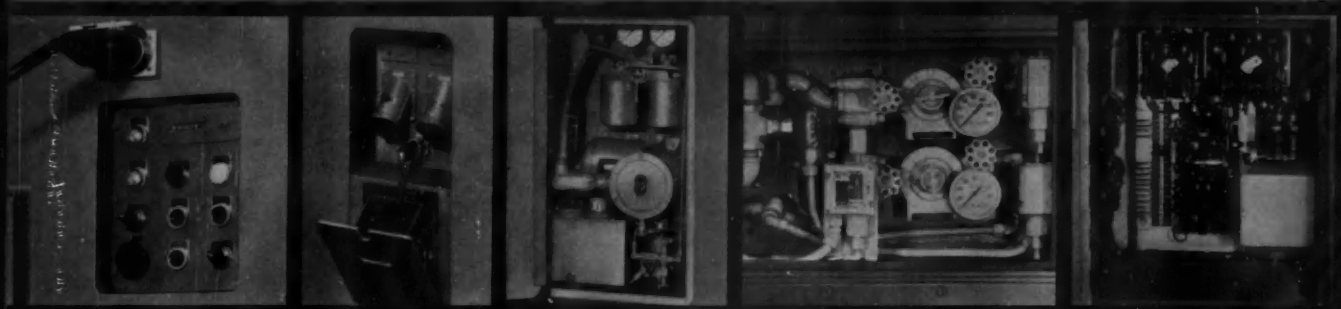
Examine it. No press in this category can match such a combination of design and operating features . . . such space-saving compactness. It's easily moved too! With lifting lug and skid type feet, you can readily hoist or pull this press to any location within your plant.



WRITE TODAY for full details on this new model, as well as the complete standard line of Niagara Adjustable Bed Presses . . . (14 to 150 ton capacities). Request new Supplement and Bulletin 60E.



CAPACITY 50 TONS. BOLSTER AREA 24 x 36.



OPERATOR'S PANEL features deluxe controls conveniently arranged for fingertip direction of press operations.

AUX. POWER SUPPLY & SAFETY BLOCK. Receptacles (440V. and 110V.) for automatic equipment, conveyors, portable tools, etc. Safety plug, chained to safety block, de-energizes entire press control when removed from receptacle.

AUTOMATIC OIL CIRCULATING SYSTEM sends clean, filtered, metered flow of oil to all bearings and gears in crown, air counterbalance, slide gibs and barrel adjustment. Correct operating oil pressure is maintained, or press stops automatically.

AIR CONTROL PANEL houses air line filter, pressure regulators, gauges, blow-off valves for clutch and counterbalance, flywheel brake and motor cutout switch behind dust-tight door.

COMB. MOTOR & PRESS CONTROL in dust-tight enclosure flush mounted in rear frame, houses disconnect switches, circuit protection, transformers, fuses, control relays and starters for main motor and lubrication pump.

NIAGARA

NIAGARA MACHINE & TOOL WORKS, BUFFALO 11, N. Y.

DISTRICT OFFICES

Buffalo • Cleveland • Detroit • Indianapolis • New York • Philadelphia

Distributors in principal U.S. cities and major foreign countries

America's most complete line of presses, press brakes, shears, other machines and tools for plate and sheet metal work.



FROM DENISON

How Caterpillar designs rugged hydraulic efficiency into Traxcavator

with Denison's new 2000 psi vane-type hydraulic pump

• Rugged dependability and high operating efficiency have been engineered into Caterpillar's new No. 977 Traxcavator with Denison's balanced-vane hydraulic pump.

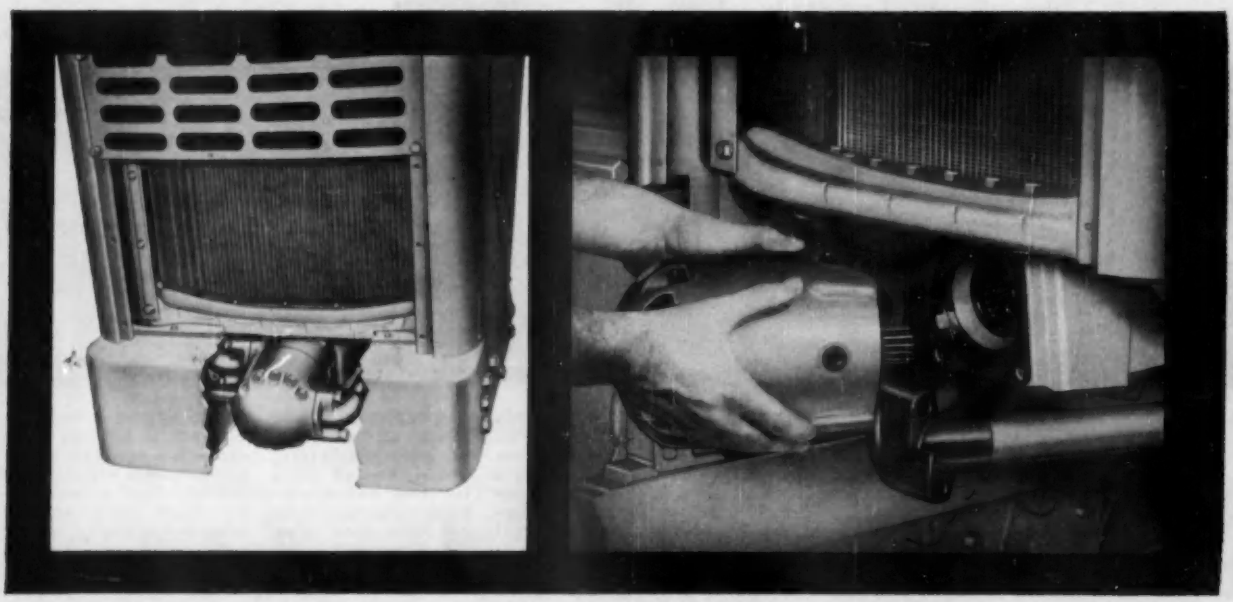
Capable of delivering continuous 2000 psi service, the Denison pump powers the Traxcavator's lifting arms—the real workers on construction equipment of this type. The pump contributes these important design features.

Packs more power . . . 50 h.p. in less space than a conventional 3 h.p. electric motor where weight and space are a premium.

Cold-weather starting . . . under severe weather conditions, to help maintain construction schedules, avoid costly delays.

Fast on-the-job servicing . . . pump easily removed and replaced as a unit without special tools or skills.

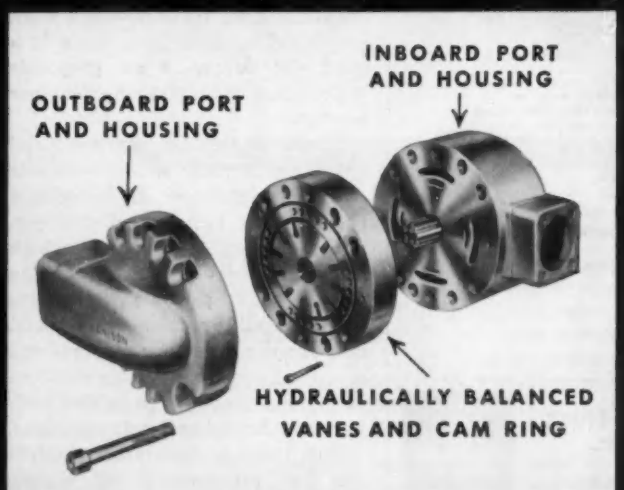
Long, efficient life . . . fully-balanced vanes and rotors reduce wear on cam rings and thrust plates to give long pump life with minimum maintenance. Internal friction is lower, volumetric efficiency higher. In the Traxcavator, the pump is operated at 1700 psi, further increasing its lifespan.



Denison 2000 psi vane-type hydraulic pump, located at front of engine, is driven through a universal joint.

Complete pump is removable as a unit to simplify servicing in the field. Special tools or skills are not required.





Denison's exclusive cartridge construction. Rugged, specially designed vanes provide dual sealing edges between vane and cam ring.

***NEW* BULLETIN 200** describes how Denison's 2000 psi hydraulic pump can improve the design and operation of all types of mobile equipment and machinery. Write Denison Engineering Division, American Brake Shoe Co., 1194 Dublin Road, Columbus 16, Ohio.



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Value Analysis

(*Continued from page* 116)

that the value analysis engineer contact the project engineer and discuss, with full understanding, the function and design requirements of any component under study. When the value analysis engineer is developing a redesign of any component, he immediately gets the agreement of the responsible project engineer on his basic idea. Since the design engineer is responsible for the function of the engine components to which he is assigned, he must approve a new design and authorize the incorporation of drawing changes.

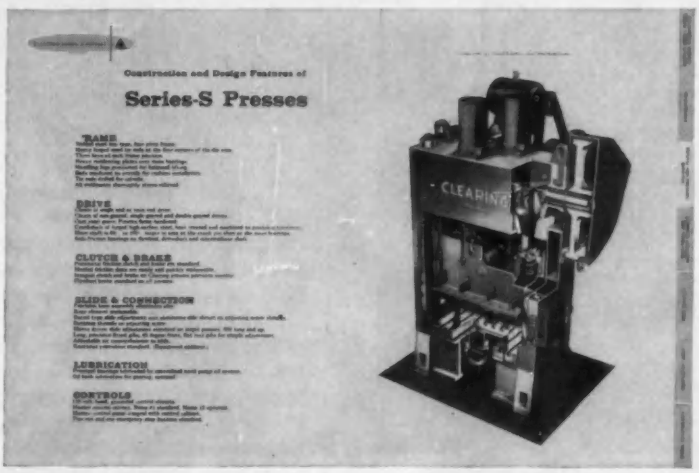
The reliability and safety factors of turbojet engine design dictate the need for rigorous testing of most engine component designs prior to their incorporation. This testing requirement tends to make the length of time from a value analysis redesign to its actual incorporation considerably longer on turbojets than on most commercial products. Since the total contract quantities of engine components are often limited and savings are based on these quantities, the length of time required to incorporate a value analysis proposal has a very great effect on saving's realization. In value analysis work on turbojets, therefore, there is a need for follow-up on proposals which may not exist on consumer products.

The follow-up by assembly and spare parts value analysis is not extremely intensive. It includes a check on the progress of predetermined testing schedules to which Value Analysis designs are being subjected, and periodic checks with the responsible personnel, who must approve the necessary changes and process the paperwork to incorporate these changes. To hasten testing and acceptance of redesigns, Value Analysis maintains a budget for the procurement of sample parts and tooling. This simple follow-up system has increased the effectiveness of the value analysis unit, since it was instituted in mid-1956, and is now felt to be a necessity on turbojet value analysis operations.

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procedures used by the value analysis unit of assembly and spare parts at Evendale, as explained in this article, are not the criterion for a successful value analysis program in every industry or plant. Each program must be "tailor-made" to suit the company in which it is organized. However, the philosophy, principles, and techniques of Value Analysis will bring dramatic results when properly applied to any product.

CASE HISTORIES OF VALUE ANALYSIS PROJECTS AT EVENDALE

THE following are examples of projects conducted by the Assembly and Spare Parts Section, Value Analysis Unit, in the fields of engineering, manufacturing, and purchasing.

Through the application of value analysis, a saving of $72,000 was realized on the stud shown in Fig. 1. This stud, which had numerous applications per engine, was originally a special machined part requiring the use of a rolled spring pin to lock it into position. The analyst who selected this stud for an intensive study obtained all the design and cost data for this item, examined the field of specialty fasteners, and found a self-locking type stud which would perform the required function. The cost of this specialty product was approximately one-fifth of the original special part cost, and in application it has performed better than the original stud.

Figure 2 shows a component of the ejector nozzle or afterburner assembly for the General Electric J-79 engine. Twenty-four cam links are used per nozzle assembly. The part as originally designed had a lug welded to each end of the hollow formed sheet metal body. The lugs required shaping from bar stock plus milling and drilling after being welded to the body.

By replacing the lugs with welded bushings, the milling and shaping of the lugs were eliminated, and only drilling of the bushings was required. The vendor supplying the assembly quoted a reduction of $235.00 per assembly for incorporation of the design change.

The two parts illustrated in Fig. 3 were being machined by conventional methods from stainless steel bar stock. By changing to a continuous milling operation these parts were obtained at a 54% savings over the previous costs.

The examples that have been shown testify to the dollar and cents practicality of a value analysis program, and exemplify the type of work an active value analysis unit can perform.

Value Analysis is a new tool which can offer a progressive company, in any type of industry, an effective assist in meeting close market competition. The increased interest and use of Value Analysis throughout the industrial nation has established it as an important part of today's industrial organization. The continued growth of Value Analysis is well-assured.

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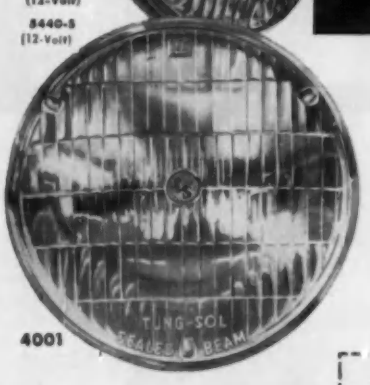
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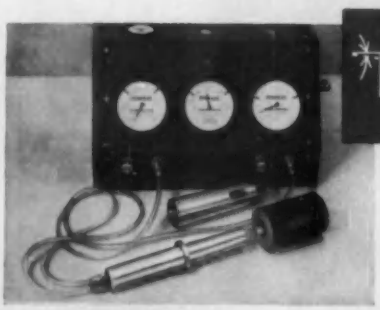
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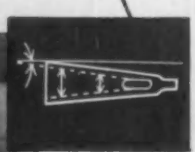
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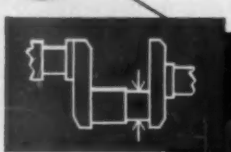
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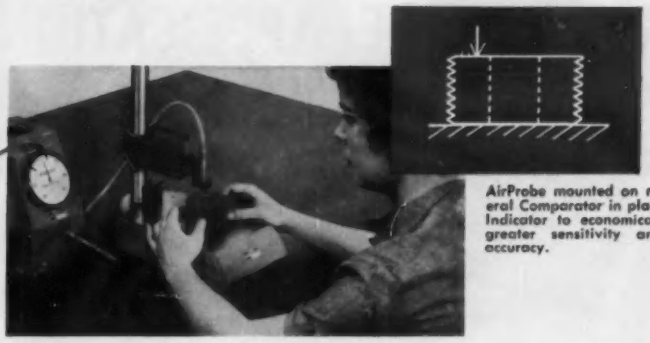
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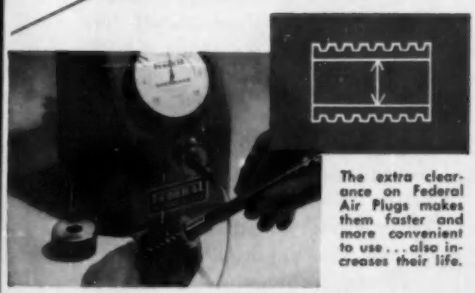
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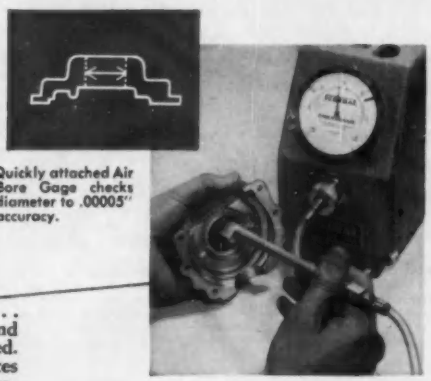
AIRPROBE Small and easily attached to many types of stock model gages. The ideal Attachment where mechanical contact is desired. Its long range per magnification and availability in .003, .006, .015, and .030 ranges adapt it for practically any type of gaging, thereby bringing the benefits of air gaging to more unusual types of measurement. The AirProbe is self-zeroing and, in effect, extends the measuring range of the Dimensionair with which it is used. Extremely accurate, the AirProbe is widely used when gaging slight tapers or eccentricity, out-of-roundness, or any similar conditions where a dimension changes gradually.



AirProbe mounted on regular Federal Comparator in place of a Dial Indicator to economically provide greater sensitivity and extreme accuracy.



The extra clearance on Federal Air Plugs makes them faster and more convenient to use . . . also increases their life.

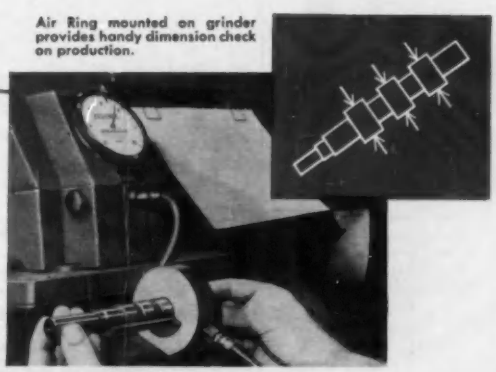


Quickly attached Air Bore Gage checks diameter to .00005" accuracy.

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Air Ring mounted on grinder provides handy dimension check on production.



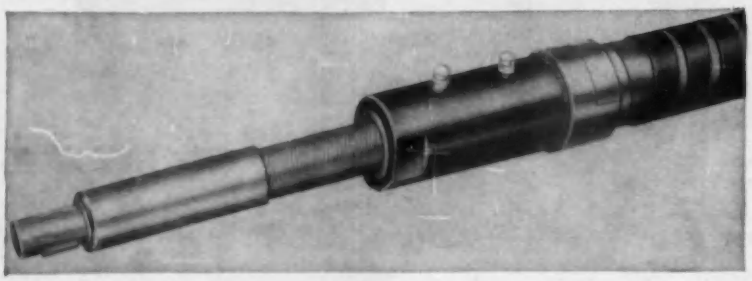


Air Snap in bench stand checks size of drill jig bushing.

ADJUSTABLE AIR SNAPS Unexcelled for accuracy and precision. Made in five sizes, 0" to 6", each having a wide range of adjustment. Anvils are precision lapped, and remain flat and parallel throughout entire range of adjustment. Does not disturb the regular Dimensionair calibration: (.003" at 2500:1 magnification.) Self-zeroing so that only a single master is required for setting to size. Can be used portably or mounted as a bench comparator.

AIR RINGS Regularly furnished with two or three jets. For special applications, can also be furnished with one, four, or six jets. Air jets are larger and recessed farther below the surface than those in competitive makes. This helps eliminate clogging and greatly reduces wear or abrasion. The addition of guide chutes as shown permits parts to be passed through the ring quickly. Rings are regularly available with inside diameters from .250" up to and including 3.010". Larger sizes can be supplied on application.

HOW TO SELECT FLEXIBLE SHAFTING FOR POWER DRIVE APPLICATIONS



1¼-inch STOW Power Drive flexible shaft with core assembly pulled out of casing.

For Power Drive applications, the following factors must be considered:

1. **Torque (Lb. In.)** to be transmitted. (The starting torque should be used in making selections.)

2. **Operating Speeds (RPM)** — If the maximum speed is higher than the rated speed, torque ratings in the table below do not apply. To find the torque capacity for flexible shafts operating at speeds higher than the rated speeds, multiply the maximum dynamic torque capacity by the rated speed, and then divide by the operating speed. (See example.)

3. **Operating Radius** — In making the selection from the table below, the radius of the smallest bend in the flexible shaft should be used.

Ratings — The ratings for flexible shafts shown in the table below apply under the following conditions:

1. when the flexible shaft is adequately supported by clamps along its length. (For unsupported shafts, multiply the calculated torque by a safety factor of 1.6—see example below.)

2. when the flexible shaft is operated in the wind-up direction, which tends to tighten the outer layer of wires. (Flexible shafts operated in the unwind direction will transmit only about 60% of the rated torque.)

3. when the flexible shaft is in continuous operation. Note: **the ratings are based on temperature rise. When the operation is intermittent, the ratings in the table may be exceeded. Consult Stow engineers for specific recommendations.**

RATED SPEED R.P.M.	MAXIMUM DYNAMIC TORQUE CAPACITY (LB. IN.) STRAIGHT AND CURVED SHAFTS RADIUS OF CURVATURE IN INCHES									Wgt./ C. Ft.	Core Dia.	Core No. and Type	Shaft Size
	50 to Strgt.	25	20	15	12	10	8	6	5				
4,500	2.4	2.2	2.0	2.0	1.92	1.9	1.7	1.5	1.25	3.0	.124/.128	2049 MH	13
3,800	7.0	6.4	6.0	5.8	5.4	5.0	4.6	3.6	2.0	4.5	.148/.152	2081 MH	15
2,900	9.4	8.6	8.0	7.6	7.0	6.6	6.0	4.8	3.4	7.0	.185/.189	5108 MH	19
2,500	22.0	20.0	18.8	17.6	16.0	15.0	12.6	10.8	9.0	12.5	.247/.252	8924 MH	25
1,800	30.0	28.0	26.4	25.0	23.0	21.0	18.0	14.0		20.0	.308/.313	8925 MH	31
1,800	33.8	31.5	29.7	28.1	25.9	23.6	20.2	15.8		20.0	.308/.313	8969 T	31
1,800	36.0	33.0	31.6	30.0	28.0	26.0	22.0	18.0	11.0	21.0	.324/.329	2034 A	31
1,500	80.0	66.0	63.0	58.0	51.0	46.0	37.0	22.0		28.5	.368/.374	2035 A	38
1,500	60.0	54.0	50.0	46.0	42.0	38.0	30.0	24.0		29.0	.387/.393	8970 MH	40
1,500	90.0	81.0	75.0	69.0	63.0	57.0	45.0	36.0		29.0	.387/.393	8971 T	40
1,150	136.0	110.0	104.0	94.0	80.0	72.0	56.0			50.5	.497/.503	8999 A	50
1,150	148	124	110	92	72	56				53.5	.505/.511	6940 T	50
900	248	200	176	124	84					78.5	.610/.618	6997 T	63
900	220	204	192	180	152	130				80.5	.630/.638	7731 A	63
750	340	224	156	76						117	.747/.753	2056 T	75
600	760	520	420							205	.998/1.004	2057 T	100
440	1,500	720								343	1.298/1.304	2058 T	125

EXAMPLE—How to use the table:
The problem is to transmit ½ H P at 1700 RPM through an unsupported flexible shaft in a 25" radius, estimated starting torque 150% of normal operating torque.

1. **Calc. Torque (lb. in.) —**
$$\frac{\text{HP} \times 63000}{\text{RPM}} = \frac{.5 \times 63000}{1700} = 18.5$$

2. **Correction factor for starting torque 1.5 x 18.5 = 27.75**

3. **Correction factor for unsupported shaft 27.75 x 1.6 = 44.4 lb. in.**

4. **Refer to Table No. 1. Read downward in column under 25" radius until you find a core having a rating of at least 44.4 lb. in. In this case we find that core No. 8970 is rated 54 lb. in. at 1500 RPM. Since the given speed is 1700 RPM, multiply 54 by 1500 and divide by 1700. 54 × 1500 ÷ 1700 = 47.6 lb in. (rated torque at 1700 RPM). Therefore, Core No. 8970 is correct.**

For Engineering Bulletin No. 570 and a free torque calculator, write

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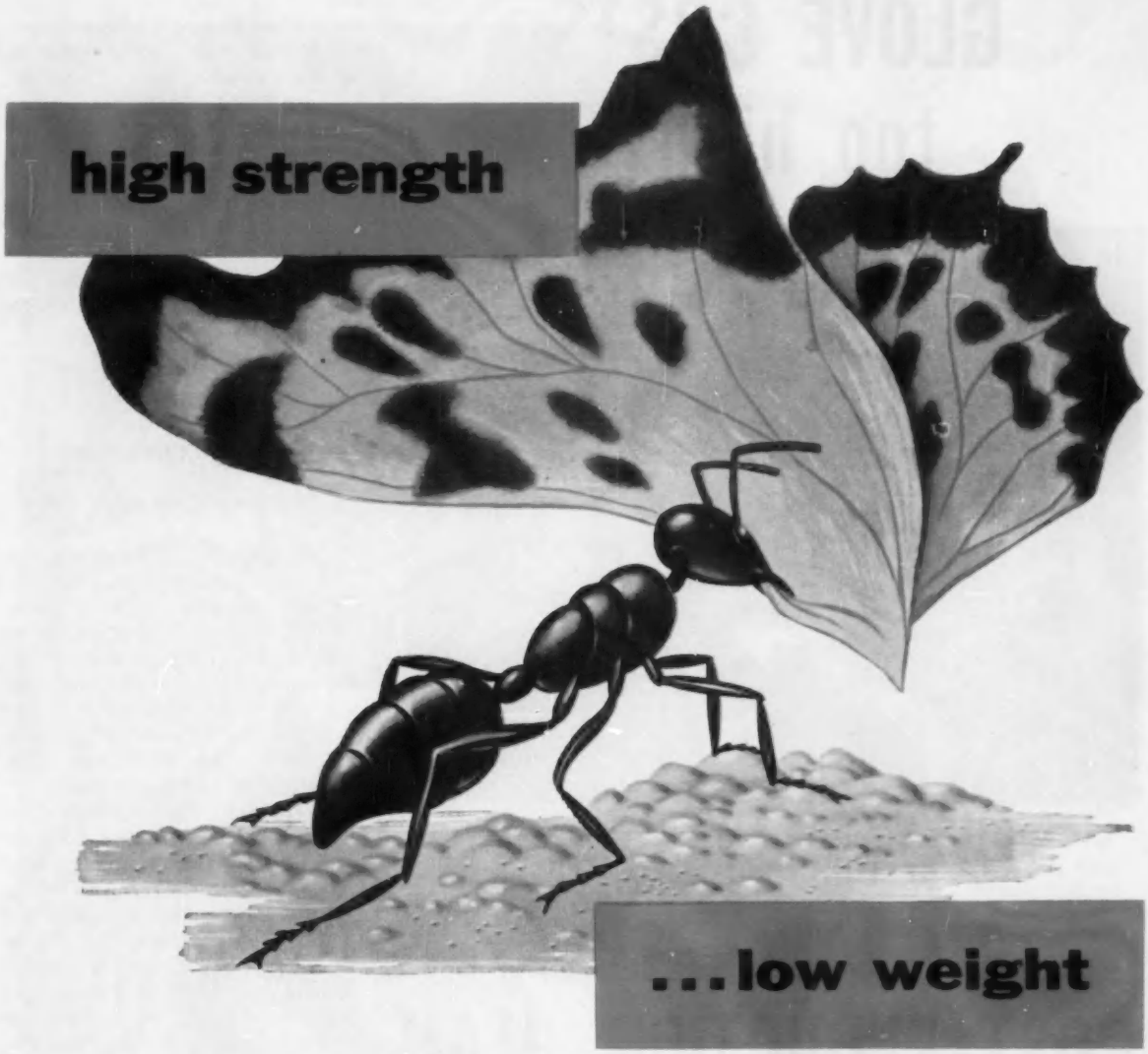
(*Continued from page* 63)

of hydraulics in the world's largest stretch forming machine was given in detail by Carl Blanchard, Sheridan-Gray, Inc. This press was designed specifically to meet the requirements of one of the West Coast airplane manufacturers for an all-jet commercial airplane. One of the problems was the development of a wing panel structure consisting of a number of single pieces of aluminum 50 ft in length, ¼ in. thick, and approximately 10 ft wide at the wing root. The design contemplates carrying these panels into the centerline of the airplane without resorting to the normally accepted joint at the point where the wing is bent to form the dihedral. By eliminating this joint the engineers calculated a weight saving of some 500 lb along with better stress distribution.

Once the approach to the machine problem had been finalized by Sheridan-Gray engineers, the forces involved in handling these panels were calculated and the means for controlling and producing them were investigated. The force required to yield the material amounted to 600 tons. The clamping forces came out to 1200 tons. Evaluation of the overall problem then resulted in the adoption of Vickers hydraulics.

The final arrangement included four tension cylinders of 150-ton pull capacity, each, on both sides of the sheet. A single cylinder of 456-ton lift capacity was placed vertically in the center of the machine to raise the die table into the sheet. Four cylinders of 600-ton pull capacity were mounted in a four-post vertical arrangement to attach the overhead clamping head to the die table. This arrangement of 13 large cylinders for positioning the jaws and articulating them to the various positions entailed considerable attention to hydraulics.

The major problem in designing the hydraulic system was that of leak prevention incident to the high pressures. Consequently, all



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pressure lines were welded and special piloted flanges were employed at all cylinder ports. Another problem was that of oil cleanness. Filters rated at four to five microns were installed at the main pump and the system was flushed through the filter for 24 hours before the initial operation of the machine.

The machine has been in full operation since February with highly satisfactory results.

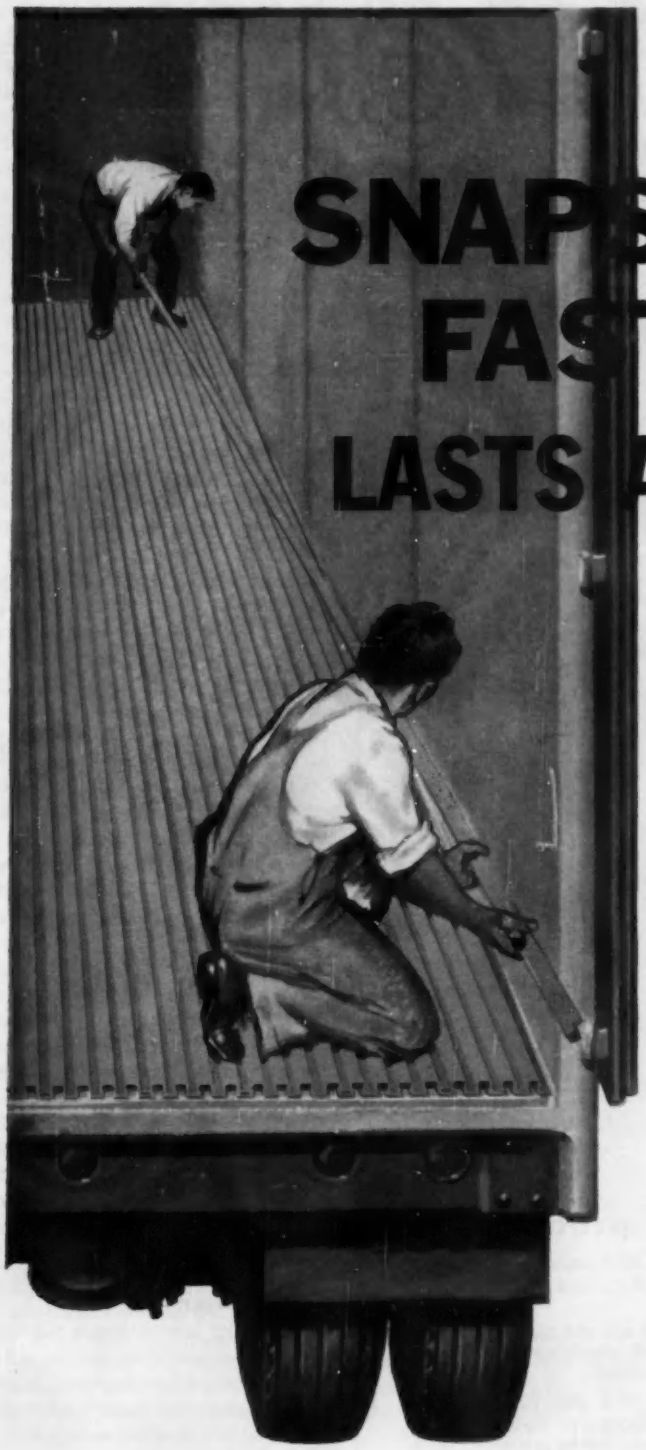
ASQC Annual Convention

(*Continued from page* 102)

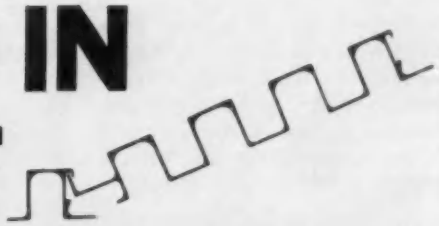
in juggling the basic criteria in selecting a supplier: quality, delivery, and price. This quality yardstick creates a partnership of quality control and purchasing, assuring the selection of good suppliers of quality material.

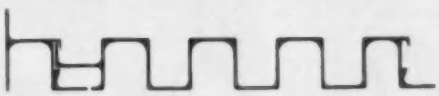
In contrast to some of the other studies, Charles W. Carter, Rath & Strong of Boston, discussed the measurement and regulation of product qualities which affect appearance but are not readily gaged by conventional instruments. It is a study of visual characteristics and the author approaches it by three alternative methods: development of special instrumentation; isolation and description of specific characteristics; and opinion rating. The author described some specific case studies, indicated the application of simple statistical techniques, and showed the practical gains derived from their use. It may be noted that the general approach made by the author was in a determination of process capabilities. The successful solution then came from changes and modifications and improvements in the way a job may be done.

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SNAPS IN FAST LASTS A LIFETIME!





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Aluminum Extrusion and Forging Facilities at Adrian, Michigan

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Special Setup at Dodge Truck Plant

for Visualization of Equipment Location

(*Continued from page 53*)

is the adoption of duPont Mylar sheet with mat surface as the base of the layout scheme. A major feature of this base is the production of a ruled surface, ruled in ¼-in. squares by a photographic process. Since the layouts are prepared to a scale of ⅛-in. to the foot, each square represents a space of 2 by 2 ft.

In seeking cost economy as well as maximum flexibility the Mylar grid sheet was chosen in preference to the aluminum grid sheet, commonly used today. Actually the Mylar board represents about 1/3 the cost of the aluminum grid technique for materials alone, without taking into account the investment in reproduction equipment required when the aluminum grid is used. Besides this, Mylar was preferred because of its transparency, since this is the basic feature of the entire scheme.

Mylar sheets for the grid board, described here, are obtained in a thickness of 0.0075 in. in 3 by 4-ft sections. Among the most important characteristics of the material are its dimensional stability and resistance to the effects of light and heat. Thus the original board retains dimensional stability indefinitely and can be relied on for accuracy.

The grid Mylar is the major feature of the layout table, since all of the scale templates of machinery and equipment are placed in the proper location and adhere to the surface. The making of these clear plastic models will be described later. For the moment it is of interest to note that the individual templates are readily lifted to accommodate changes in layout and will adhere anywhere. Moreover, they are fully transparent for visual examination as well as for reproduction.

Complementing the Mylar grid sheets is a top sheet of clear Mylar, 0.005 in. thick, which is used exclusively for tracing the course of the myriad of conveyor lines. This keeps the conveyor layout separate from the floor plan, thus making for further flexibility when plant or departmental rearrangement becomes necessary. To effect rapid identification of conveyor lines, Dodge Truck has found a series of 19 colors of "Blue-Zip" which are printable on blue line paper.

The plant layout board serves a great many functions. In the initial stages of plant arrangement, it provides a definite pattern for the arrangement of equipment, conveyors, and other items. The board also has great utility in daily use. For example, if any department needs a layout of its arrangement, it is a simple matter to remove a section of the Mylar and run off a blue line print. Similarly, when plant engineering is requested to make a



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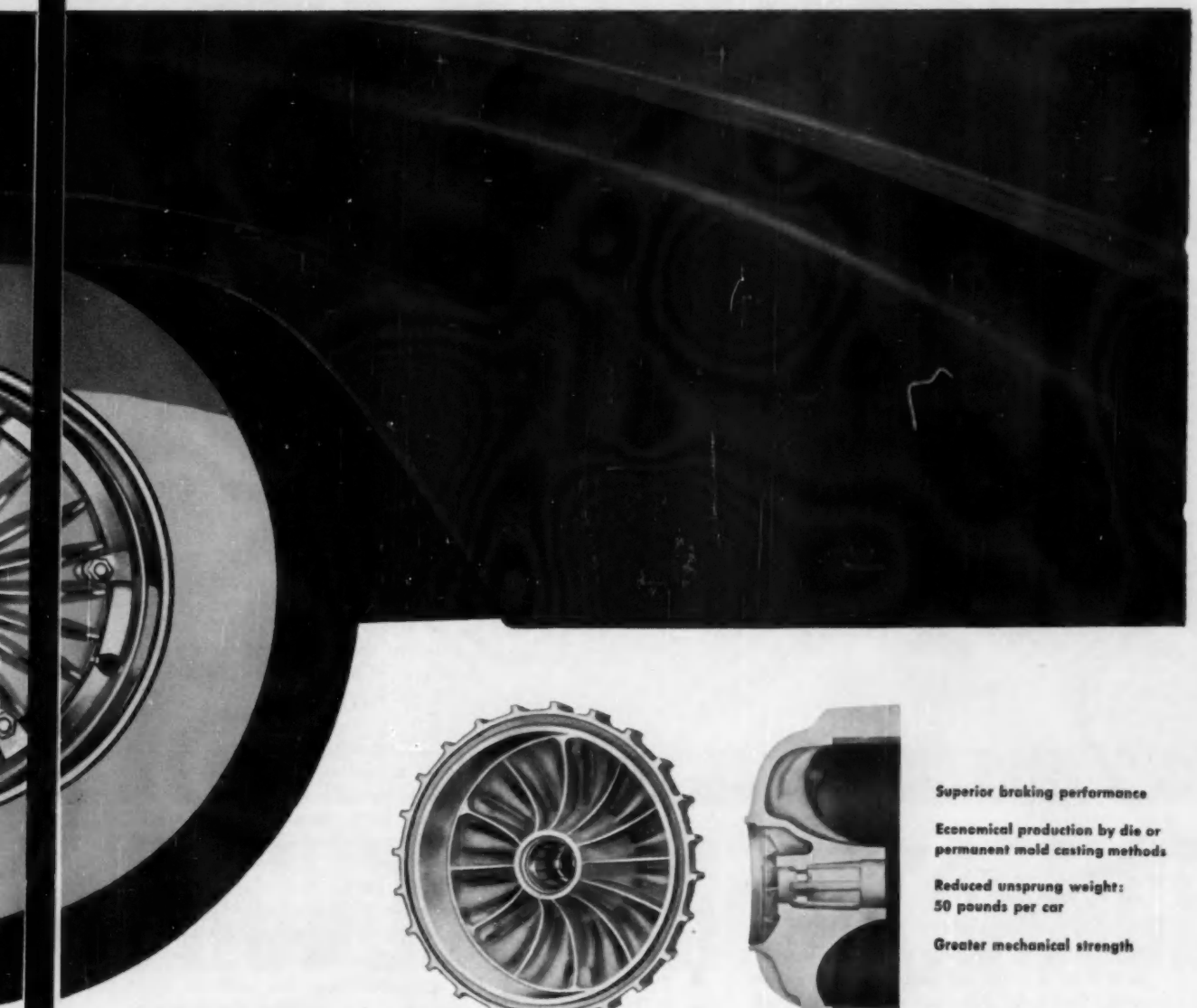
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Superior braking performance

Economical production by die or permanent mold casting methods

Reduced unsprung weight: 50 pounds per car

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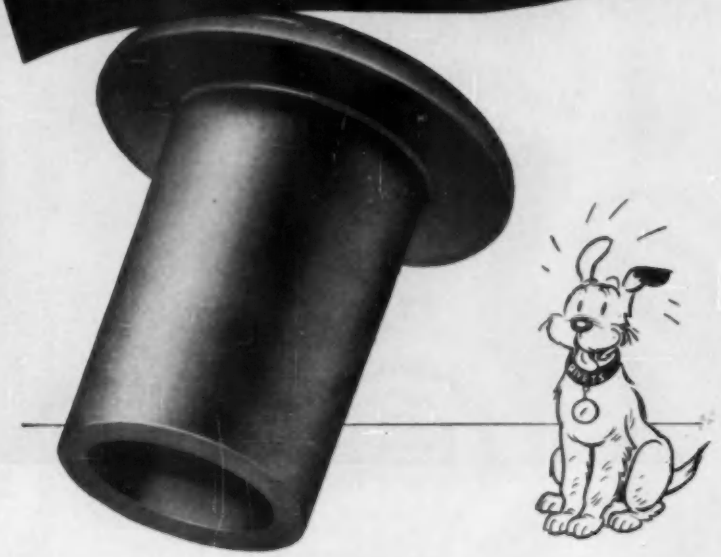
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Rivet catalog describing 1388 standard tubular and split rivets and 26 single and multiple automatic rivet setters.



Dodge Truck Plant

(*Continued from page* 130)

change in layout for any department, it is a simple matter to isolate a given section and prepare it for the necessary changes.

The transparency of the Mylar makes it easy to visualize changes in equipment and rearrangement with reference to existing conveyor lines. On the other hand, if any sections of the conveyor system require detail changes, this can be done simply by changing the course of the conveyors on the top Mylar sheet.

Perhaps one of the major features of the setup is the fact that a conventional Ozalid 42-in. Streamline machine handles all of the requirements. It will produce perfectly legible blue-line prints of the grid Mylar alone or in combination with the top sheet that carries the conveyor lines. This is another of the economy features of the technique.

Incidentally, this technique employs a special color code for the various templates for quick identification when scanning the board. This code is as follows: walls and stairways—black; existing equipment of permanent nature—brown; equipment to be relocated—yellow; new items of equipment — red; stock—blue-green.

Consider now the methods employed for producing the ⅛-scale templates. First of all, the layout of a given item or machine or line is prepared in the form of the usual drawing, to a scale of ¾-in. to the foot. This layout then is photographed and reduced to the ⅛-in. scale. The camera negative then is used for printing on an acetate film in the Ozalid machine. When the film has been developed, each sheet is adhered to a double-back Scotch tape No. 666.

The function of the Scotch tape is two-fold: it provides a good backing for the film, making it a simple matter to cut out the templates; and it leaves a permanently adherent film of adhesive on the template for adherence to the Mylar film. After the templates have been cut to size, the backing is peeled off



PRODUCT PERFORMANCE

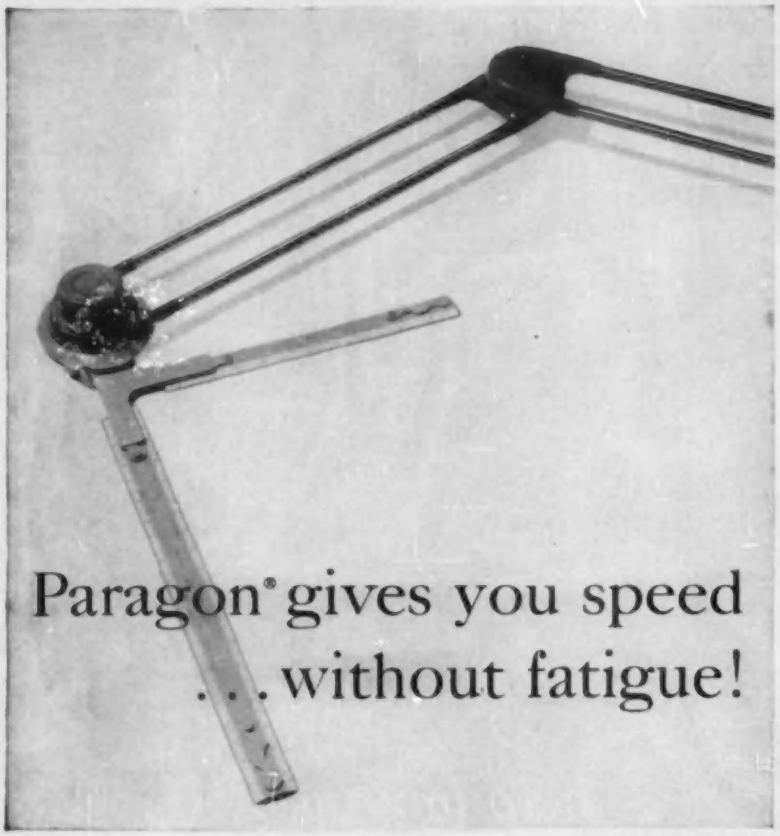
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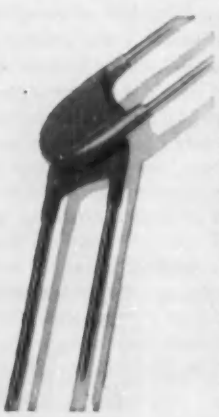




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and the template is ready for use. As mentioned earlier, the template can be readily lifted from the Mylar and will adhere equally well in another location.

The production of the color code for conveyor lines, turns, elevations, etc., provided a much more difficult job at the beginning. The solution was found eventually in the adoption of the "Blue-Zip" plastic sheet which is used in conjunction with a backing of MMM No. 666 double-back adhesive tape. For delineating conveyor lines the plastic strip first is adhered to the backing tape. Then the thin lines are cut accurately on a conventional paper cutter, using suitable gages for different widths. After the thin lines have been cut off, the backing is peeled off and the strip will readily adhere to the Mylar.

It may be noted at this point that the Dodge truck plant boasts over 1,600,000 sq ft of floor space in four individual buildings, the largest of which is Bldg. No. 101—the main building. The latter is approximately 680 by 1260 ft. These dimensions dictated the use of a ⅛-in. scale to hold the size of the layout to a workable limit. Actually, there are four layout tables in this department—one for each building. The table described here, for Bldg. No. 101, is 8 ft, 10 in. by 13 ft. For Bldg. No. 102, the table is 3 ft, 7 in. by 7 ft; for Bldg. No. 201, 3 ft, 7 in. by 5 ft; for Bldg. No. 301, 3 ft, 7 in. by 8 ft, 9 in.

In addition to the many functions of the layout board, mentioned above, it is also desirable to keep a permanent record of plant layout as it existed before changes were made. For this purpose it is the practice to make blue-line prints of each section for record purposes, again demonstrating the flexibility of this new technique.

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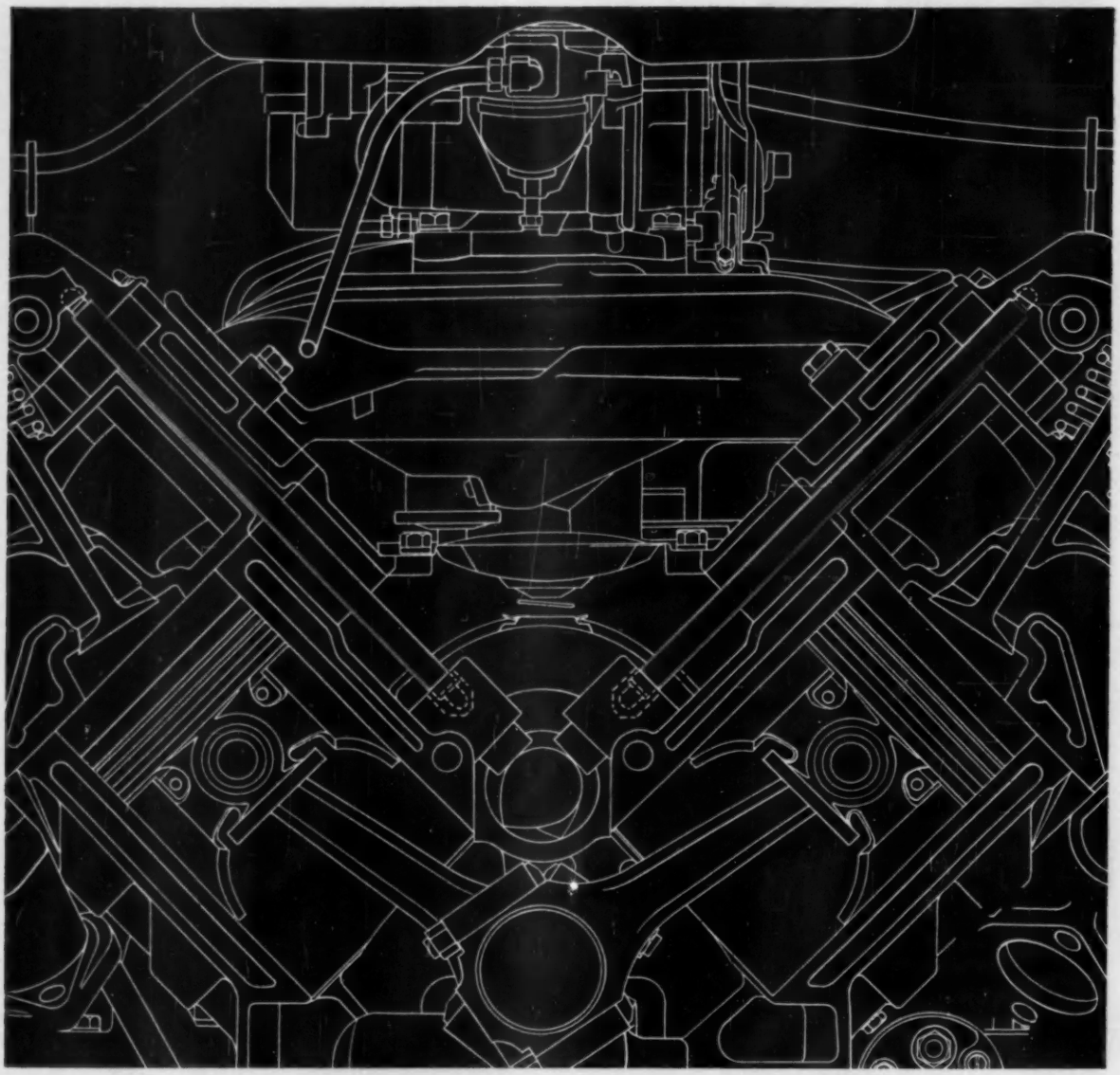
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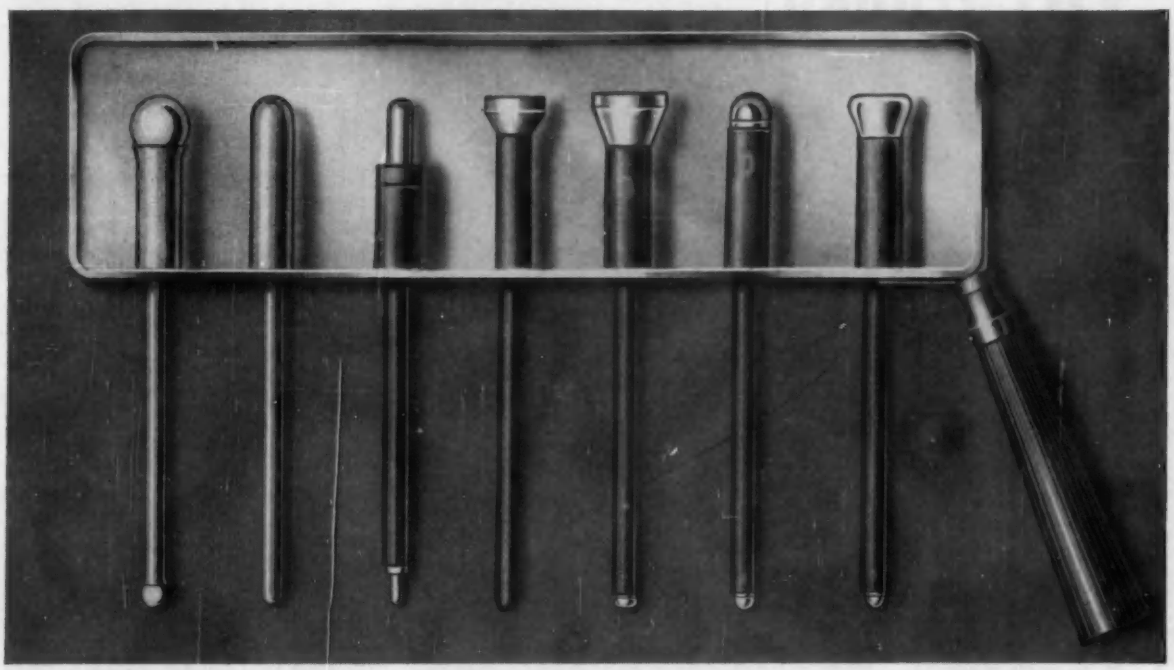
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(*Continued from page* 62)

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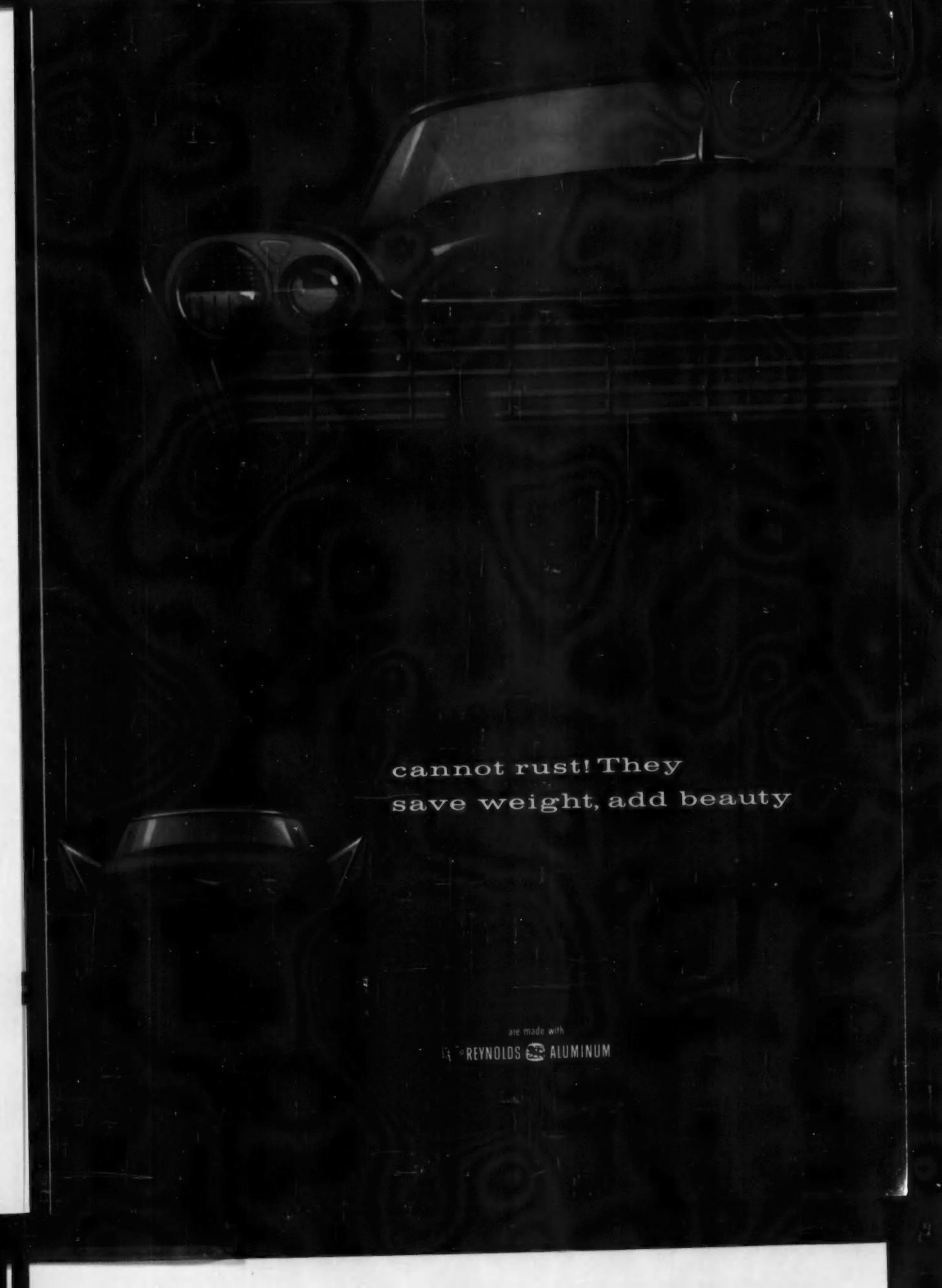
Washington grows more concerned over the loss of Government scientists and engineers to industry. Government officials are trying to devise new ways to stop the exodus.

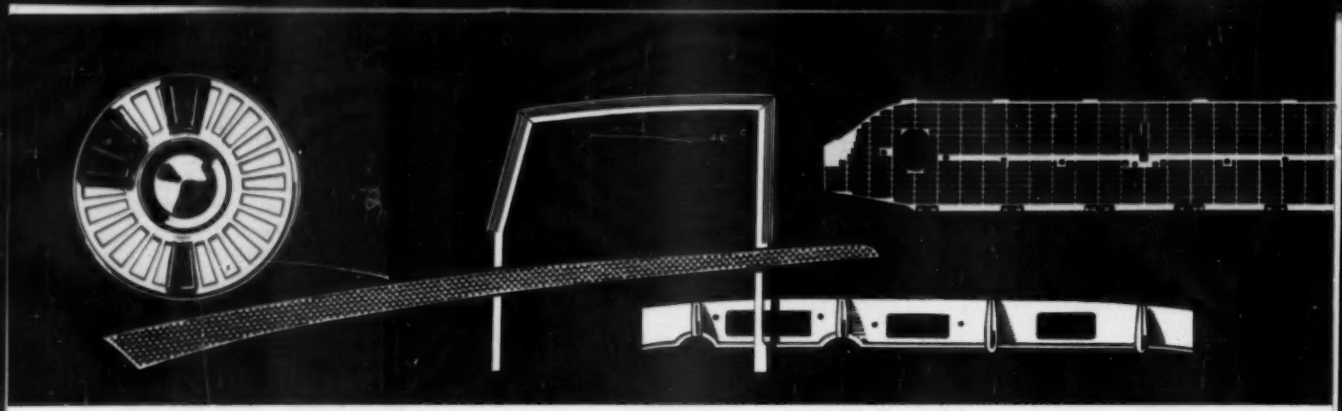
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Fewer new cars for official travel by Government workers are in prospect for the fiscal year beginning July 1. Lopped off by a House Appropriations Committee move was a request by 18 independent Federal agencies for authority to add to their cars.

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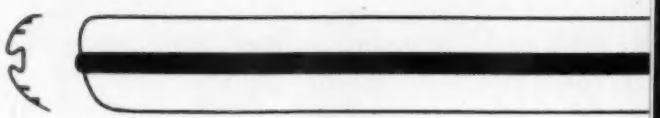
Commerce Dept.'s controversial Office of Strategic Information will be abolished. Deprtment officials, at least tentatively, have decided to kill the office following more than two years of congressional fire.


cannot rust! They
save weight, add beauty
are made with
REYNOLDS ALUMINUM



ALUMINUM BUMPERS, durability proved on cross-country buses for years, are getting close attention today for passenger car applications. Why? Because aluminum bumpers last longer—will not rust. Because they cut weight—give brakes less load to stop. Because they can be clear or color anodized with the "look of sterling" or the "gleam of gold" or other colors. Because they cut tooling costs—can be fabricated economically. For example, in an aluminum bumper extrusion, reinforcing members can be designed integral with the bumper itself. And it is also easy to extrude a groove for inserting a rubber or plastic bumper face.

Aluminum bumpers are only one application where the automotive industry can cut costs, reduce weight, increase beauty by using aluminum. Grilles, instrument panels, wheel covers, emblems—all types of decorative trim inside and out—as well as countless motor parts, are proved applications for this modern metal. And for lighter, brighter tomorrows, aluminum roof panels, rear decks and hoods are already stimulating the imagination of the forward looking automotive industry.



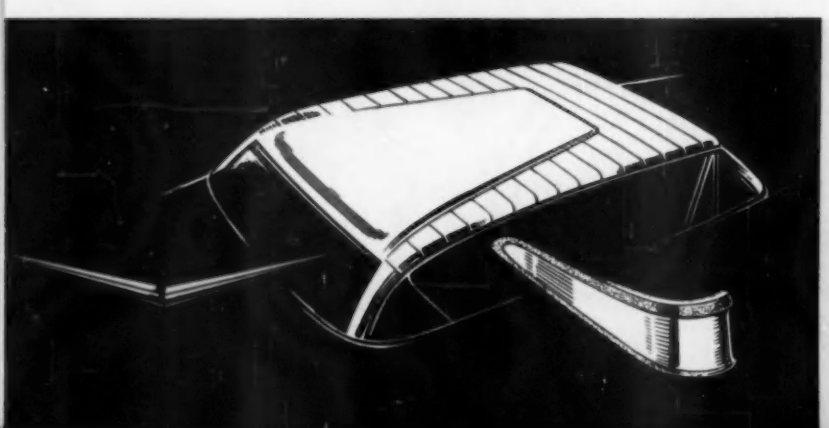
For aluminum mill products or for fabricated aluminum parts and trim, Reynolds Aluminum Specialists will be glad to work with you to help you get the very most from the aluminum you use. For details, call the Reynolds Office listed under "Aluminum" in your classified telephone directory. Or write *Reynolds Metals Company, Fisher Building, Detroit 2, Michigan* or *P.O. Box 1800-MV, Louisville 1, Kentucky.*

NOTE: Before you buy any part—have it priced in aluminum. Basic material costs do not determine part costs. New techniques and processes—applicable only to aluminum—can give you a better product at a lower *final* cost.

See "CIRCUS BOY", Reynolds dramatic series, Sundays on NBC-TV

Reynolds Aluminum

THE METAL FOR AUTOMATION



The Finest Products Made with Aluminum are made with REYNOLDS ALUMINUM

AIRBRIEFS

(*Continued from page* 96)

Removing Snow and Ice From Aircraft

A cost study, made by the U.S.A.F. Development Center in Maine on a B-52 de-icing by using ethylene glycol showed that it took 500 gal of ethylene glycol solution at a cost of $750 plus two hours time. A new method using hot air from an AiResearch GTC gas turbine took 20 gallons of JP-4 fuel for the turbine costing $2.25 and 100 gal of dilute ethylene glycol solution costing $35 and only one-half hour of time. The savings for removing 24 in. of snow and ice from the tail surfaces of one B-52 empennage by the new method was $713.75 and one and one-half hours time.

Hot air (300 F) from the turbine at 50 psi was piped through a hose and directed over the surfaces of the jet bomber. Air from the nozzle was directed from the platform of a Pitman hydraulic lift mechanism.

Giant Stretch Press

Excavation has been completed at Convair (San Diego), a Division of General Dynamics Corp., for a giant $500,000 Cyril Bath stretch press, one of the largest ever built. The radial draw forming machine scheduled for delivery in September will be used in the production of the Convair 880 jet transport.

The new stretch press is a 75-ton, 360-deg device, measuring 75 ft long, 30 ft wide and 12 ft high. It will be equipped with a 35-ton transverse wiper permitting extremely accurate forming of parts.

The radial draw former will also have an automatic elongation yield control, which senses the state of yield in the material, then monitors the proper hydraulic pressures for forming control, and minimum springback. Another feature of the installation is a 150-in. diameter rotary work table.

Helicopter Tug

Planes, official publication of the Aircraft Industries Association, re-



SEMS BY Everlock®

HOLD TIGHTER! COST LESS!

Ever hear someone say "they don't make 'em like they used to"? Well, it's a good thing they don't! Modern autos, for instance, last up to three times as long as the cars of twenty years ago.

Sems by Everlock are one of the reasons. Every modern auto has a thousand and one places where Sems grip tight for the lifetime of the car. The illustration shows Sems used on a station wagon tailgate. Often used for both business and pleasure, station wagons get abuse and vibration that are sure to work old-time fasteners loose. But, Sems by Everlock actually hold tighter the more you try to shake 'em loose.

Here's Why You Should Order SEMS by Everlock . . .

1. **Cut costs** by eliminating separate handling of screw and washer.
2. **Simplify ordering** by reducing the number of items carried and quantities stocked.
3. **Eliminate waste** due to lost lock washers.
4. **Eliminate rejects** due to omitted lock washers.
5. **Fast delivery** on a wide range of sizes, types and finishes.



Everlock Sems are available in a wide range of types and sizes. Ordering "Sems" is not enough, only Everlock Sems, preassembled lock washers and screws, have the exclusive, full chisel edge locking action.

Other Everlock fasteners that feature the exclusive full chisel edge locking action include **Free Lock Washers, Locknuts and Terminals.**

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512 North Dearborn Street • Chicago 10, Illinois
Subsidiary of AMERICAN MACHINE & FOUNDRY CO.

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Another AMF Product
Everlock
INDUSTRIAL FASTENERS

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Scott & Steffen, Inc., Cleveland, Ohio
Kenneth D. Delaney, Dayton, Ohio
Sam T. Keller Co., Detroit, Michigan
C. W. McNeil, Inc., Houston, Texas
D. G. Tooling Co., Indianapolis, Ind.
James E. Cleary, Marblehead, Mass.
Thom Lundeen, Moline, Illinois
J. Ramsey Reese, Inc., New York, N. Y.
Hank Workman, Pleasure Ridge, Ky.
W. Henry Cordray Sales Co., Philadelphia, Pa.
Oregon Indust. Factors, Portland, Oregon
Howard N. Clark, Rochester, N. Y.
Forrest Moschner, St. Louis, Mo.

veals that the newest wrinkle in tugs is the flying tugboat—a helicopter. Recent tests in which a military helicopter towed a 3000-ton LST (Landing Ship, Tank) at about half the LST's normal cruising speed, showed that the ship was more maneuverable under aerial tow than under its own power. The tests also showed that cable snapping was practically eliminated when a whirlybird did the towing.

Tenth Anniversary Of All-Cargo Airline

Seaboard & Western Airlines on May 10 became the first airline to complete 10 years of continuous transatlantic all-cargo service. Two giant Seaboard Super Constellation freighters crossing the North Atlantic on scheduled flights in both directions signaled a decade of growth which has seen an increase of over 500 per cent in transatlantic air trade since 1947, the company reported.

The only scheduled transatlantic all-cargo airline, Seaboard initiated operations on May 10, 1947, with one DC-4. Today, it operates a fleet of 10 Super Constellations and three DC-4's. In the 10-year span its aircraft have flown 48,247,700 revenue miles while logging over 8700 ocean crossings. Seaboard has grown from an initial investment of $150,000 to a publicly owned company with a net worth of over $8,100,000.

ROCKFORD

WHICH KIND OF CLUTCH ?



There is no one stock answer to every power transmission control problem. That is why ROCKFORD clutch engineers can be of practical help in designing applications that will increase *your* product's efficiency and reduce servicing down-time.

An engineered-to-the-job ROCKFORD CLUTCH application involves recommendations covering the proper type — spring-loaded, over-center, multiple-disc, gear-tooth or splined-to-shaft drive —as well as torque rating, shock-load absorption, slippage control, vibration dampening and provision for frequent drive shaft reversals.

Regardless of your needs, ROCKFORD CLUTCH engineers can specify a size and type clutch that will operate most efficiently in your product—conserving space, power and final cost. Send a print or a description of your clutch need for their recommendations—

ROCKFORD Clutch Division BORG-WARNER

315 Catherine Street, Rockford, Illinois, U.S.A.

Export Sales Borg-Warner International — 36 So. Wabash, Chicago 3, Ill.

CLUTCHES

G-E Introduces CJ-805 Commercial Jet Engine

The General Electric Co. on May 23, 1957, introduced a full-scale model of its CJ-805 commercial jet engine, designed to power the world's fastest jetliners.

The light-weight, high-thrust engine was exhibited for the first time at a press conference preceding the opening of the 22nd Salon International de l'Aeronautique in Paris, France.

The CJ-805 engine is designed to give high performance at low cost. Design principles of the engine's military counterpart, the G-E J79, have been proved in thousands of hours of ground and flight tests. The J79 powers the Convair B-58, the Lockheed F-104A and the Grumman F11F-1F.

AiResearch Phoenix Expands Facilities

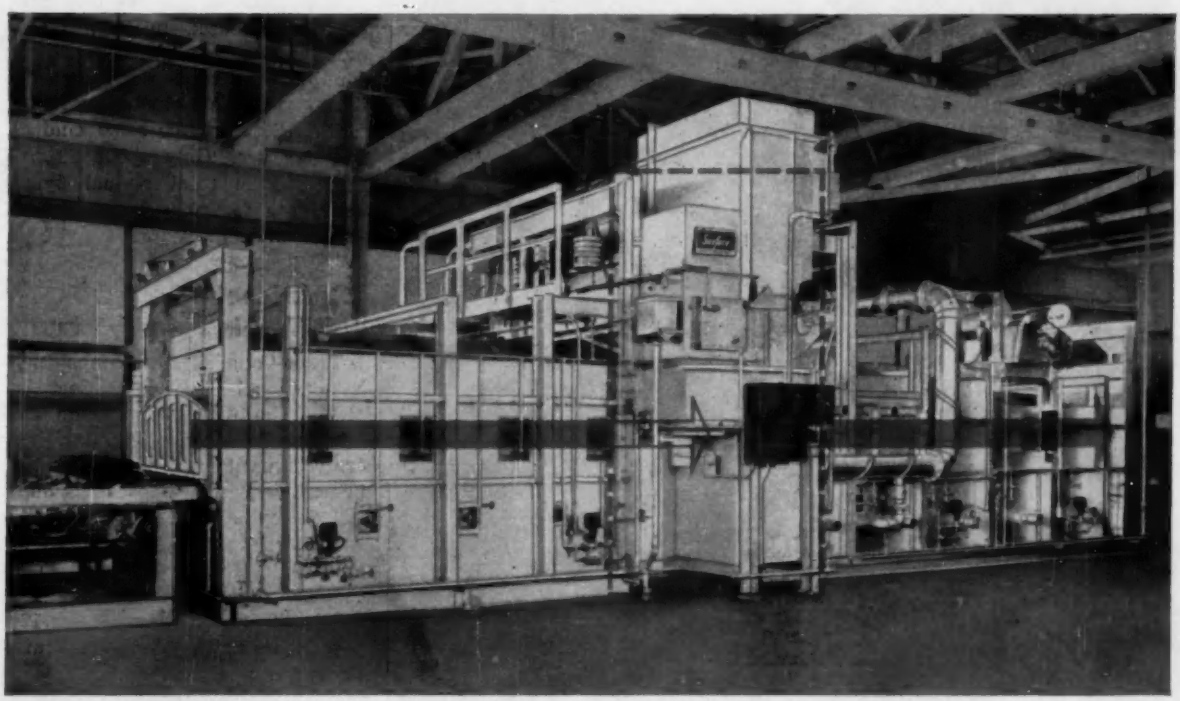
Expansion of electronic and pneumatic control facilities at The Garrett Corporation's AiResearch Manufacturing division in Phoenix, Arizona, will total 40,000 sq ft of working area and be completed some time early in June.

The construction which is in addition to the half million footage already in operation by the Garrett division will house 500 workers engaged in the company's growing electronic and valve business.

Shipments of Utility And Executive Aircraft

During March 608 two- to ten-place utility and executive aircraft were shipped. These aircraft are valued at $9,558,000, figured at the

Superfast cooling for cycle annealing



A furnace-within-a-furnace makes this Surface cycle annealer one of the most versatile heat treat units in the country. It anneals, cycle anneals, and normalizes gear forgings of different size, shape, and alloy at the net rate of 864,000 lbs. per month or better.

Such exceptional versatility is achieved by a superfast cooling zone. Really a full convection furnace within a direct-fired furnace, this zone is isolated by refractory doors. It can be used or by-passed, depending on which of many cycles the customer wants. As a result, the customer can heat treat as many as 13 different alloys in this one furnace.

Adding to the flexibility of the furnace is a modular tray design. Each module is an 18x20-inch chrome alloy casting. Modules can be combined to hold any size of work up to 800 pounds. They are also used to carry work outside the furnace.

This furnace-within-a-furnace is another proof that Surface engineers are old hands at creating new ideas in heat treating.

Write for Bulletin SC-146 on cycle annealing.

Surface Combustion Corporation, 2397 Dorr St., Toledo 1, Ohio. In Canada: Surface Industrial Furnaces, Ltd., Toronto, Ontario.

wherever heat is used in industry

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Send for illustrated bulletin describing Fairfield's facilities.



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If GEARS are a vital part of the product you make, there is no finer recommendation for the QUALITY of your product than to be able to say it is equipped with "FAIRFIELD GEARS."

Long producers of the gears needed in high grade trucks and tractors, Fairfield now brings the same standards for GEAR PERFORMANCE to a wide variety of products: Agricultural Implements . . . Power Shovels . . . Machine Tools . . . Diesel Locomotives . . . Road Graders . . . Lift Trucks . . . Road Rollers . . . Pump Drives . . . Winches . . . Military Vehicles . . . and a host of others.

Fairfield's facilities are unexcelled. Here "under one roof" in a new and ultra modern plant, Fairfield has everything needed for producing all kinds of gears: spur . . . herringbone . . . spiral bevel . . . ground tooth spiral bevel . . . straight bevel . . . coniflex bevel . . . hypoid . . . zerol . . . worms and worm gears . . . splined shafts . . . differentials. Get acquainted with Fairfield — your inquiry will receive prompt attention.

FAIRFIELD

MANUFACTURING CO.

2303 S. Concord Rd., Lafayette, Indiana

For FINE GEARS

manufacturers' net billing price.

The aircraft were sold by eight U. S. general aircraft manufacturers, and included 468 aircraft of four-place or more (including 90 small twin-engined craft) and 140 of less than four-place. Shipment by seven companies the previous month totaled 461 valued at $7,075,000.

More than half of the total airplanes now used in the general aviation fleet are owned primarily for business purposes and more than two-thirds of the flying hours of this fleet are for some kind of business use. Only about 20 per cent of the total annual flying hours are for pleasure and other non-business purposes.

TCA's Fleet "All Turbine" by 1961

Trans-Canada Air Lines will have an all-jet airliner fleet by 1961. The fleet will include the Douglas DC-8 turbo-jet, the Vickers Vanguard turbo-proper and the presently used Vicker Viscount turbo-prop.

DC-8's are planned for TCA's trans-Atlantic and first-class transcontinental services in 1960. The DC-8 will have a capacity for 120 passengers each and fly at a cruising speed of 550 mph.

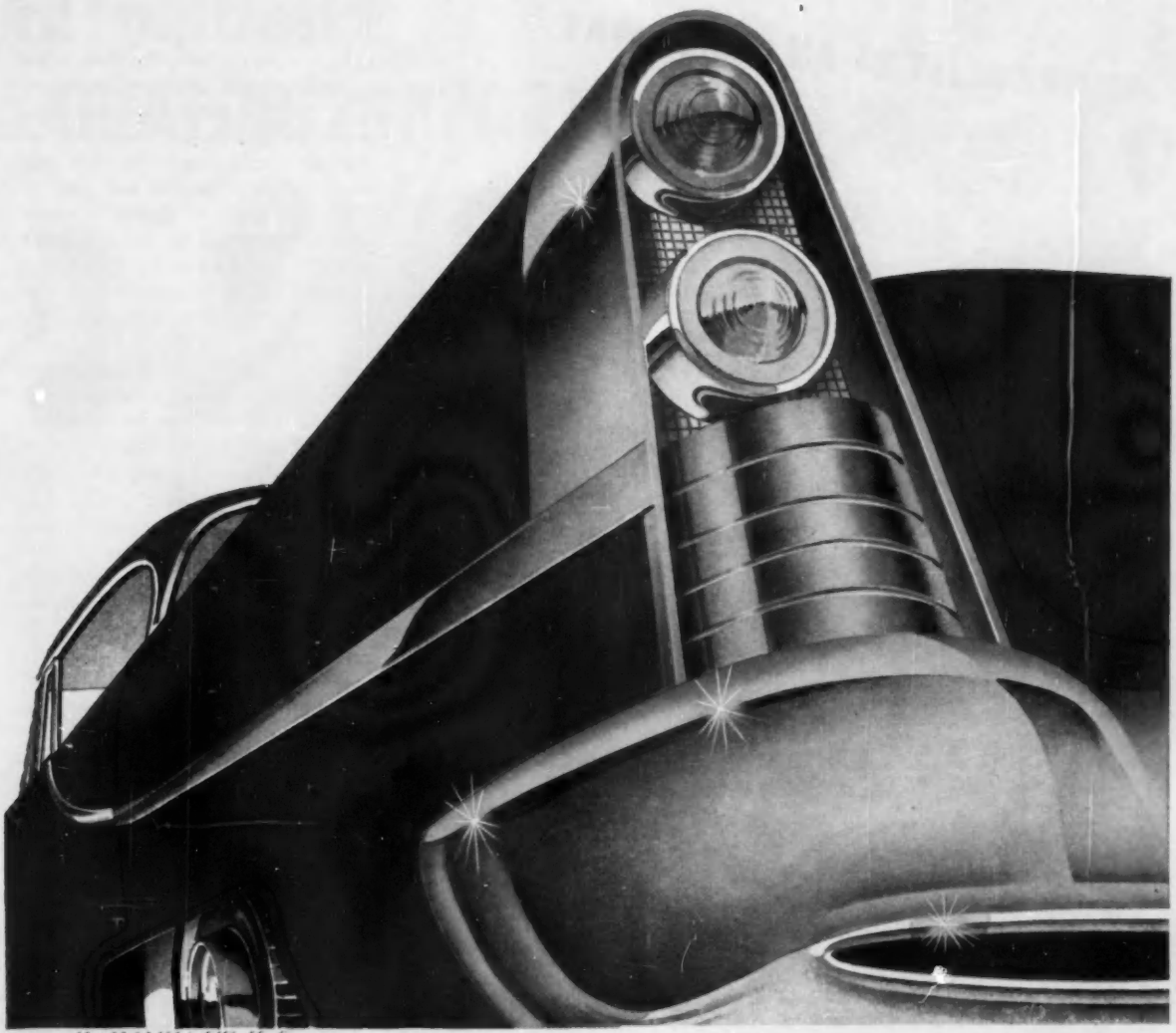
Scheduled for first deliveries in 1961, the big turbo-prop Vanguard is made by Vickers, manufacturers of the Viscount. It will cruise at 420 mph and carry 80 to 100 passengers plus cargo.

Already in operation by TCA is the Vickers Viscount, a four engine turbo-prop flying schedules across Canada and to U. S. cities.

French-Built Caravelle Jet Airliner

We had our first ride, a most pleasant experience, in a jet transport. It was in the twin jet Caravelle built by Sud Aviation, the largest aircraft manufacturing firm in France.

The Caravelle is presently on tour of the United States introducing the jet liner to the American airtransport industry. We took advantage of its special visit to St. Louis, Mo., on May 27, where it performed for the 1957 Conven-





The beauty of Crucible stainless steel is its superior resistance to corrosion

Why do today's cars have as much as 55 lbs. of stainless steel per car? Because this metal is strong but lightweight, beautiful and durable, highly resistant to corrosion. It's the ideal metal for wheel coverings, window frames, top and body trim, grilles, taillight housings, bumper guards and instrument panels.

Tomorrow you'll be using even more pounds per car. For example, you may be able to use it for posts and pillars, chassis frames, floor and roof deck panels. And the beauty of designing with stainless is that your designs can easily be produced because of fabricators' extensive experience with this versatile metal.

Keep abreast of new developments in stainless steel by ordering *Crucible sheet and strip*. Crucible promptly supplies standard grades and finishes in practically any width and thickness. And if design and fabrication problems arise, Crucible engineers and research teams will cooperate with you in every way.

Free *Stainless Steel Selector* contains complete data: nominal composition of all grades • physical properties • resistance to corrosion, scaling • data on machining, welding, hardening. Write: *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*



CRUCIBLE first name in special purpose steels

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THERE MUST BE AN EASIER WAY



—AND THERE IS WITH . . .

MIDLAND

WELDING NUTS

The Midland Steel Products Company is constantly developing new, progressive ideas to improve the efficiency of its fine products. It pioneered the *Midland Welding Nut,* for example, and so successful was this application in its own shops that this labor-saving device has been made available to others.

If you are a manufacturer of metal parts or products and have fastening, fabricating or assembling problems, you may find Midland Welding Nuts just the solution you've been looking for. The Nuts are easily welded into position for the lifetime of the product. You can be assured of correct fit, even in the most awkward, hard-to-reach places. Bolts turn easily into the applied nuts. Thus, heretofore two-man operations can be handled by one man in most instances. Weld-nut equipped parts will be preferred by your customers for they will find them cost-saving and trouble-free, cutting down assembly time. Too, you can be sure that your parts will be properly assembled without the risk of rattles.

A few minutes' time in checking the assembly problems of your customers will be profitable to you. Midland Welding Nuts are low in cost, can give you a definite advantage over competition. This practical application is recognized internationally and endorsed by many designers of the finest products.

The MIDLAND STEEL PRODUCTS COMPANY

6660 Mt. Elliott Avenue • Detroit 11, Michigan
Export Department: 38 Pearl St., New York, N. Y.

Automobile and Truck Frames • Air and Vacuum Power Brakes
Air and Electro-Pneumatic Door Controls

tion of the Aviation Writers Association.

It is notably free of cabin noise and vibration. As one passenger said, "it's like flying a magic carpet close to heaven." Another remarked "once people fly this way they certainly prefer the jets to the older type of piston powered aircraft." Speed of the Caravelle is 515 mph. It can fly 2200 miles non-stop with 64 passengers. As a tourist type it has a capacity for 80 passengers.

It was stated that if the United States tour results in sufficient orders by the airlines an assembly line for the jet transport will be set up by Republic Aviation Corp. at Farmingdale, Long Island.

One design feature which greatly contributes to the relative noise and vibration free cabin is the location of the British Rolls-Royce Avon engines at the tail of the craft.

Another feature is the low turbine speed of the jet engines. It is the first jet aircraft which the noise-conscious Port of New York Authority has allowed to land at one of the greater New York area airports.

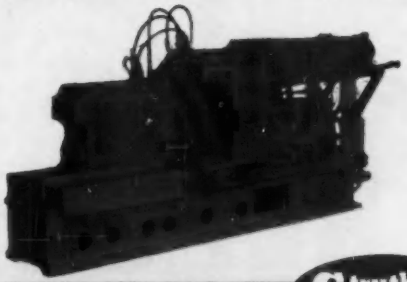
BOOKS . . .

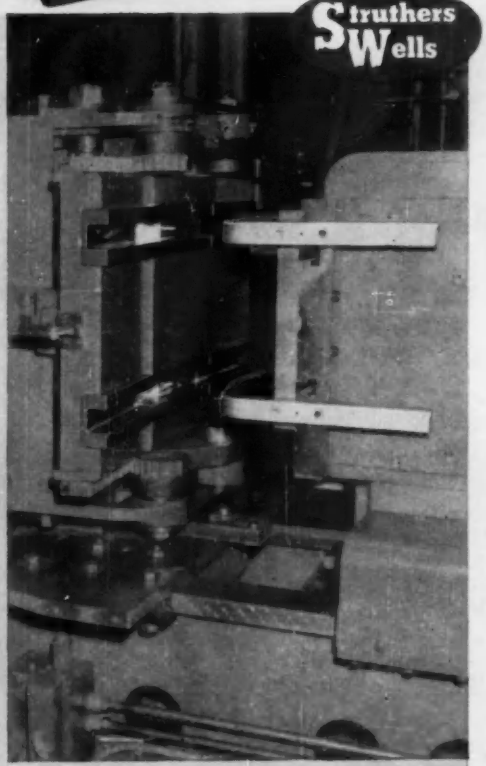
A HANDBOOK OF HARD METALS, *by W. Dawihl, published by Philosophical Library, Inc., 15 E. 40 St., New York 16, N. Y. Price, $10.00.* This is an abridged translation of a work which originally appeared in Germany. The first part of the book deals with the scientific principles of sintering, which are necessary (according to the author) for an understanding of hard metal techniques. The second part describes the technical production of hard metals, and the third part discusses the techniques for turning hard metals into tools and the use of the tools themselves. The author makes frequent reference to the researches and experiments of other investigators in the field, in order to substantiate his own findings.

ANNUAL REPORT 1956; NATIONAL BUREAU OF STANDARDS MISCELLANEOUS PUBLICATION 220, *published by National Bureau of Standards. Price, 60 cents. (Order from Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.)* This report summarizes the work done by the National Bureau of Standards in the physical sciences during 1956. Besides describing the Bureau's activities in such fields as maintenance of basic standards, measurement, calibration, and testing, the report lists NBS accomplishments in programs dealing with electronic computer, properties of matter and materials, and data storage. The report includes an appendix, which contains a complete list of publications by NBS staff members for the fiscal year.

AUTOMOBILE RADIATOR SUPPORTS...*radially edge-bent in a single rapid operation with*

TANGENT BENDERS





Typical of the high production delivered by Struthers Wells Tangent Benders on products for the automotive industry, are steel supports for radiators. Here, the preformed, punched and notched channel is given two smooth bends in a single cycle, two units at a time, with production running several hundred per hour. Bending capacity like this awaits *your* large-volume needs —write us!

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Machinery Division: **TITUSVILLE, PA.** • *Offices in Principal Cities*

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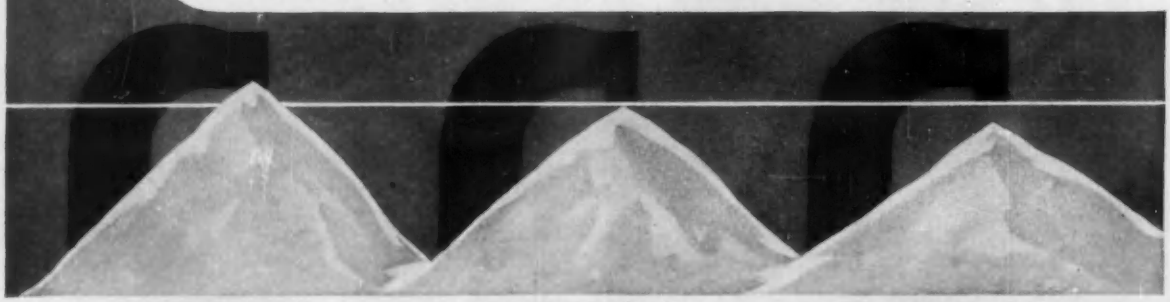
PROCESSING EQUIPMENT DIVISION Crystallizers . . . Direct Fired Heaters . . . Evaporators . . . Heat Exchangers . . . Mixing and Blending Units . . . Quick Opening Doors . . . Special Carbon and Alloy Processing Vessels . . . Synthesis Converters

MACHINERY DIVISION MACHINERY for Sheet and Structural Metal Forming . . . Tangent Benders . . . Folding Machines . . . Roller Table and Tumble Die Bending Machines . . . Press Brakes . . . Punching and Notching Machines . . . Forming Dies

Now in Production...

3 NEW REPUBLIC IRON POWDERS

...WITH Controlled dimensional factor



TYPE "G" TYPE "N" TYPE "S"

REPUBLIC

REPUBLIC STEEL

World's Widest Range of Standard Steels

To meet the varied requirements of industry, Republic's Metal Powder Division has developed and is producing three new grades of iron powder suitable for the molding and manufacture of mechanical parts.

Each one of these new powders has a variable controlled characteristic known as *Controlled Dimensional Factor.* This term simply means that in the presence of copper, Republic Iron Powder—depending on type—can be made to grow, remain stable, or shrink, within acceptable limits. These new powders have been designated as:

TYPE "G" FOR GROWTH—A powder having a definite growth-characteristic in the presence of copper, and developed for use in many *existing* dies designed for powder which expands when sintered.

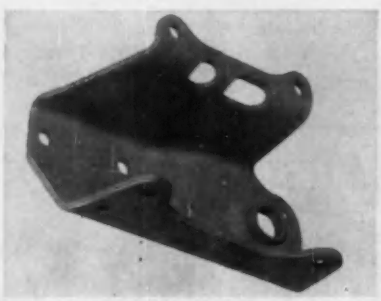
TYPE "N" FOR NORMAL—This powder has been given normal variation in dimensional change from a slight shrinkage to a slight growth, depending upon the end-result required.

TYPE "S" FOR SHRINKAGE—A powder with an extremely high shrinkage-characteristic which can be used to attain certain tensile strengths with lesser quantities of copper.

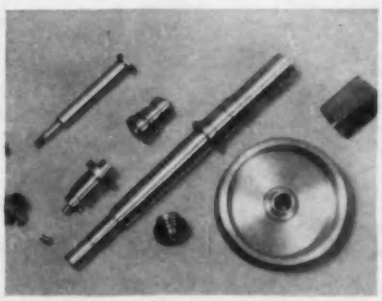
Both "S" and "N" powders should prove exceptionally advantageous to parts producers faced with the problem of what to do with dies that have become oversize through wear. Types "S" and "N" make possible the production of parts to original dimensions without the need for extensive or expensive re-working of dies.

Controlled Dimensional Factor is an exclusive Republic development retaining the excellent chemistry and high green strength always associated with Republic Iron Powder.

For complete information on chemical composition, physical properties and test evaluations, write for Republic Booklet Adv. 763.



PRODUCTION FACILITIES, plus complete design and engineering service, go to work for you as an extension of your plant, when you have stamped and drawn parts fabricated by Republic's Pressed Steel Division. One example of a wide variety of steel parts mass-produced to specification, at the lowest possible cost, is the truck-shaft bracket shown above. Write for Booklet Adv. 681.



PRODUCTION OF PRECISION PARTS at higher speeds and feeds with fine finished surfaces and longer tool life, is made possible by the use of Republic Cold Finished Steels. Republic offers you a complete range of carbon, alloy, and stainless analyses drawn to precise size and cross section. Mail the coupon today for complete information on Republic Cold Finished Steels.



PRODUCTION OF BUILT-UP, INTERLOCKING OR ASSOCIATED PARTS is greatly simplified by the use of Republic Cold Drawn Special Sections. Machining time and costs are reduced to a minimum because the sections are preformed to the predominating cross section of the part. Cold drawing also improves physical properties in the parts. Available in all grades of carbon, alloy and stainless steel. Send coupon for more data.

STEEL

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Please send more information on these Republic products:
- ☐ Iron Powder (Booklet Adv. 763)
- ☐ Stampings (Booklet Adv. 681)
- ☐ Cold Finished Steels
- ☐ Special Sections

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

MACHINERY NEWS

(*Continued from page* 79)

The drill has been tested on such materials as tungsten, porcelain, molybdenum and diamonds. One effect, however, is to produce extremely high temperatures. In drilling diamonds, the inventor discovered that the temperatures reached the point at which they began to disintegrate unless the electron stream was reduced and gas added to cool the diamonds.

Mr. Steigerwald also received a patent for a method of producing tiny ball bearings by using electron streams. Hard ball bearings can be produced from aluminum oxide and other materials by using the process, he says.

Bullard Off Million

First quarter 1957 net shipments of The Bullard Co. totaled $9,575,656, compared with $10,765,044 in 1956.

Natco Expands

A new 75 by 530-ft building has been added to the main plant of the National Automatic Tool Co., Inc., Richmond, Ind. This latest step in Natco's plant expansion program increases manufacturing space by 30 per cent to bring the firm's floor space to a total of 342,000 sq ft.

Tool and Die Survey

Recognizing the importance of the contract tool and die industry to future mobilization requirements, the Business and Defense Services Administration has recently completed the most extensive survey ever made of the industry. On the basis of this survey covering nearly 3000 contract plants, BDSA plans to issue a detailed report on the mobilization status of the industry to the Director of Defense Mobilization and other appropriate Defense agencies. The Metalworking Equipment Division survey revealed that the value of the gross production of the industry for 1955 was $939,000,000. The association's own estimate of the volume of special tooling shipments for 1956 was in excess of one billion dollars. For the first part of this year, trustees reported that the volume of orders in most tool centers was a little above that of a year ago.



We're Proud of Our "1133"



FASCO

AUTOMATIC RESET MOTOR PROTECTOR

. . . NEW . . . but *proved* for positive protection against overloads and short circuits in low-voltage electrical equipment!

Yes, Fasco's new "1133" is now accepted as a standard safeguard for motors used in such applications as actuating seats, window-lifts and windshield wipers. Leaders in the automotive field regard its unique ability to protect low-voltage electrical equipment . . . and its dependability . . . as proof that it pays to

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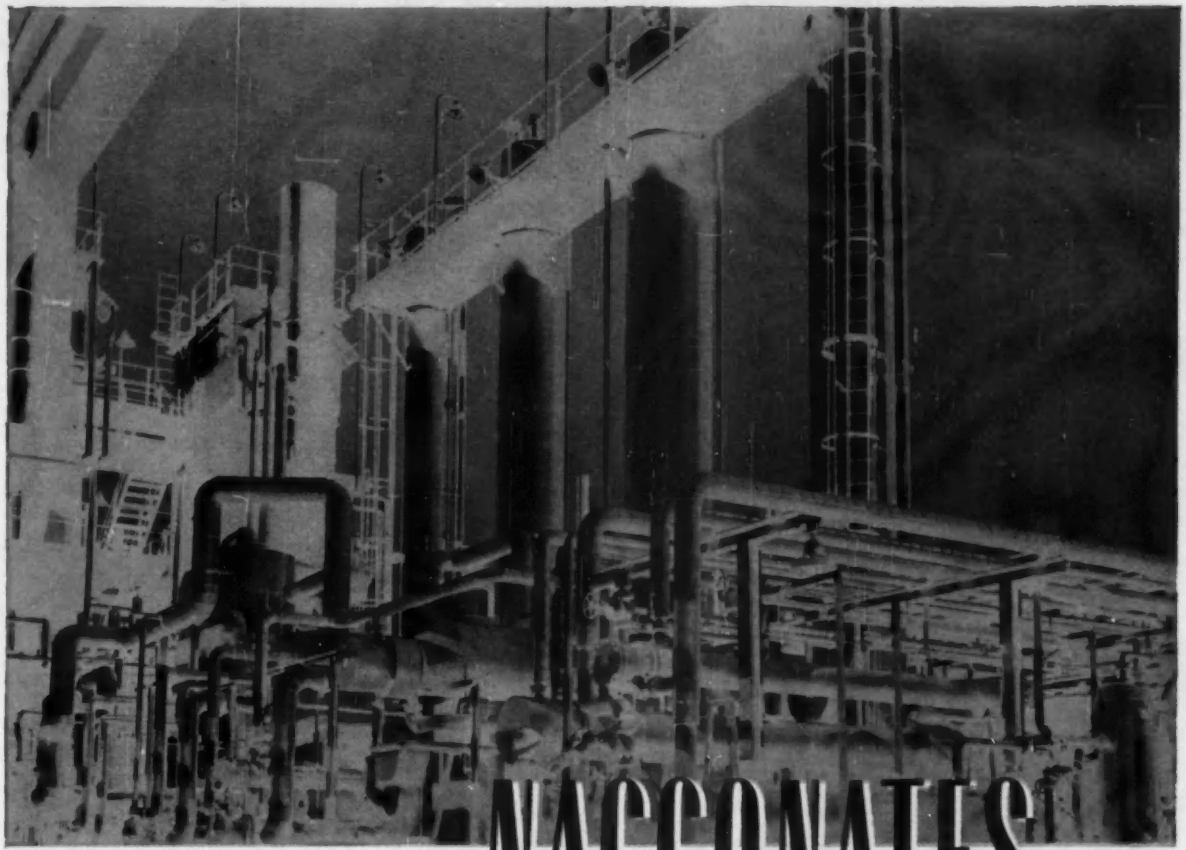
Reynolds New Facility

(*Continued from page* 55)

and light gage roller levellers, two reclamation furnaces for melting chips, a deep pouring station to cast larger ingots, three deep soaking pits for heating the larger ingots, two new soaking-pit cranes to handle the larger ingots, a large scalper, a shipping building, a crane for loading large and heavy plate, ultrasonic inspection facilities, and augmented laboratory facilities to provide for testing and quality control of plate products.

Since beginning its operation last December, the facility has supplied components for every major aircraft manufacturer.

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Our multimillion-dollar plant at Moundsville, W. Va. is now producing NACCONATES in substantial commercial quantities for urethane makers. We are prepared to supply whatever quantity you need for development or full-scale production.

If you are doing research in the urethane field, we will be glad to share with you the product and application data developed in our Buffalo Research Laboratories. The coupon at the right is for your convenience.

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Please mail me literature checked below:

- ☐ Technical Bulletins I-17A to F on NACCONATES
- ☐ Application Data Sheet 41156—Flexible Foams
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- ☐ Interested in Literature only.
- ☐ Have representative call by appointment.

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DD-14



CAE power chalked up another record recently, when a Ryan XQ-2B Firebee jet target drone set unofficial world's records of 53,000 feet altitude and 104½ minutes of flight at Holloman Air Force Base.

The J69-T-19A is one of three gas turbines now in production at CAE. A second version, the J69-T-9, powers Cessna and Temco jet trainers for Air Force and Navy respectively, while the Model 141 air compressor is the heart of the TC-106 mobile starting unit for jet aircraft.

●

ENGINEERS!

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SHORTIES

During World War II, one engineering hour was required for every 15 hours of direct manufacturing. Today, the ratio is one engineering hour for every three hours of direct manufacture.

●

A tiny electronic device, about the size of a penny box of matches, has been developed by electronic experts in the aircraft industry to aid control of deadly supersonic guided missiles. Yet, 6000 of these devices together would require less electricity than is required to light a 60-watt light bulb.

●

A record 77 million U. S. citizens today are licensed drivers. One-third of the total are women.

●

Thirty-two per cent of all elementary and high school pupils depend on buses for their transportation to and from school.

●

There are more than 10 million people in the U. S. employed in highway transportation industries.

●

There is one motor vehicle in the U. S. for every 2.6 people in the population. In China, the ratio is approximately one vehicle per 5000 people.

●

A worker had to work 30 minutes to buy a dozen eggs in 1951, but only 19 minutes in 1956. Similarly, a pound of bacon, down from 26 to 19 minutes, requires 27 per cent less labor today. And to purchase a pound of coffee now takes 31 minutes of work, compared with 33 minutes in the earlier period.

●

Passenger car registrations increased 92.5 per cent, from 28.213 million in 1947 to 54.3 million in 1956.

●

U. S. cars, trucks and buses covered 4.9 trillion miles during the 10-year period, using 386 million gal of gasoline.

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Automotive Instrumentation



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DISTINCTIVELY
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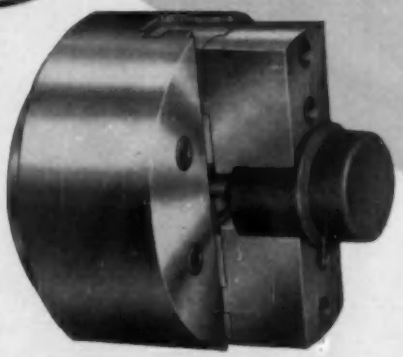
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POWER CHUCKS



for more gripping power– higher production

Famous S-P cam and lever design holds the work tighter, permits cost cutting heavy feeds and multiple cuts. S-P cam and lever design also resists opening of jaws by centrifugal force or diminishing air pressure . . . an important safety factor. Balanced for high rpm.



S-P SELF-CENTERING CHUCKS are built in Universal American Standard models, sizes 6" – 8" – 10" – 12", and Serrated models in 8" – 10" – 12" sizes. Two or three jaws.



S-P COMPENSATING CHUCKS grip out-of-round work with equal pressure on each jaw. Available in 8" – 10" – 12" sizes, two and three jaw models, American Standard or Serrated.

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Air and Hydraulic

Adequate stroke for long jaw travel of S-P Chucks. Balanced for high rpm on machine tools and other applications. Details in Catalog No. 105 (Air) and Bul. 201 (Hydraulic).

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NON-ROTATING AIR AND HYDRAULIC CYLINDERS • ROTATING AIR AND HYDRAULIC CYLINDERS
POWER CHUCKS • COLLET AND DRILL PRESS CHUCKS • AIR PISTONS, VALVES, ACCESSORIES

New Defense Facilities

The following list of Certificates of Necessity supplements those issued up to April 17 as published in the May 15 issue of AUTOMOTIVE INDUSTRIES, page 176. These certificates authorize new or expanded defense plant facilities for manufacture of automotive and aviation war goods.

Latest additional Certificates, below, announced by the Office of Defense Mobilization, cover April 18 to May 15, inclusive. Figures in parentheses denote percentage authorized in respect to actual fast tax write-offs.

AMERICAN NON-GRAN BRONZE CO., Berwyn, Pa.
Military aircraft engine parts—$35,904 (65)

AVCO MANUFACTURING CORP., Crosley Div., Nashville, Tenn.
Military aircraft facilities—$31,443 (65)

BEECH AIRCRAFT CORP., Wichita, Kans.
Military aircraft—$403,978 (65)

BENDIX AVIATION CORP., Eatontown, N. J.
Military aircraft equipment—$450,000 (40)

BENDIX AVIATION CORP., Sidney, N. Y.
Military jet engine parts—$204,267 (65)

BOEING AIRPLANE CO., Seattle, Wash.
Military aircraft—$926,300 (60)
Military aircraft—$849,836 (65)

CURTISS-WRIGHT CORP., Quehanna, Pa.
Research and development—$2,911,076 (60)

DOUGLAS AIRCRAFT CO., INC., Sacramento, Calif.
Missile test facility—$2,455,600 (70)

FAIRCHILD ENGINE & AIRPLANE CORP., Hagerstown, Md.
Military aircraft engines—$76,800 (60)
Military aircraft and parts—$83,852 (65)

FAIRCHILD ENGINE & AIRPLANE CORP., Wyandanch, Long Island, N. Y.
Guided missiles—$42,248 (65)

GENERAL LABORATORY ASSOCIATES, INC., Norwich, N. Y.
Military aircraft engine parts—$139,000 (45)

LOCKHEED AIRCRAFT CORP., Sunnyvale, Calif.
Research and development—$927,188 (60)
Research and development—$713,049 (65)

NORTHROP AIRCRAFT, INC., Hawthorne, Calif.
Military aircraft—$210,000 (60)

THOMPSON PRODUCTS, INC., Cleveland, Ohio
Military jet engine parts—$6,169,801 (65)
Military aircraft engine parts—$1,579,792 (65)

THOMPSON PRODUCTS, INC., Franklin Co., Va.
Missiles components for military use—$6,480,000 (70)

UNITED AIRCRAFT CORP., Hamilton Standard Div., Windsor Locks, Conn.
Military aircraft parts—$1,033,580 (65)

UNITED AIRCRAFT CORP., Pratt & Whitney Aircraft Div., East Hartford, Conn.
Military aircraft engines—$1,120,000 (65)

UNITED AIRCRAFT CORP., Sikorsky Aircraft Div., Stratford, Conn.
Military helicopters—$11,425,000 (60)

WELCO, INC., Wellington, Kans.
Military aircraft parts—$9,047 (45)

WESTON HYDRAULIC, LTD., North Hollywood, Calif.
Military aircraft parts—$11,872 (70)

SURE DELIVERY



Yale Truck speeds shipments of new Chrysler transmissions.

FROM ASSEMBLY TO SHIPPING, TRANSMISSIONS GET SMOOTH, SAFE RIDE ON YALE TRUCKS

At the huge Chrysler Power-Flite Transmission plant in Indianapolis, Yale Electric Trucks keep pace with a steady flow of new transmissions as they come off the assembly line. These rugged, 6,000 lb. capacity Yale Trucks pick up 15 transmissions at a time, carry them quickly and safely to loading docks for fast shipment.

This relay operation is continuous and trouble-free because Yale Electric Trucks are built to stand up under heavy-duty working conditions. And, to assure safe, smooth, shock-free handling of heavy loads, Yale Electric Trucks feature Yale's exclusive Magnetic Cam-O-Tactor for controlled acceleration, shock-resistant steering mechanism for extra handling ease, lowered cowl for better visibility, "Dead-Man" control to set mechanical wheel brakes when operator leaves the truck. Capacities: 1,000 to 150,000 lbs.

To meet the need of expanding industries for better materials handling methods, look to Yale for advances in research, engineering, manufacturing, sales, service—as

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Gasoline, Electric & LP-Gas Industrial Lift Trucks • *Worksavers* • Warehousers • Hand Trucks • Hand and Electric Hoists

Still Faster Five Hundred

(*Continued from page* 61)

Russo, posted fourth, made the best showing but three, four-cylinder engines paced him to the wire.

There may be a number of explanations involved here but to this observer (and others) it appears to be a question as to fuel consumption/ tire wear/ car weight—vs fierce speed and acceleration. Some of the newspaper accounts of the race accepted the results as answering this question.

Leaning toward the statistical side of the race's technical background, the accompanying tables show that 25 of the 33 qualified starters (there were only 31 *actual* starters—thanks to the unorthodox start) were built by Kurtis-Kraft. Of these, 12 were 500G2 model, built new for the '57 race; 10 were 500C, new for '54; one was 500G and two were 500F, new for '56.

Eddie Kuzma had four starters —going back only to '55; while Epperly, Salih, and Phillips had one each—built for this year. One other independent—the Dunn chassis—started.

These figures seem to confirm the impression now circulating among mechanics and car owners that competition equipment is drifting into a standardized, package unit, which is bought off the shelf, so to speak, and put to work on a dollar basis, minus skill, ingenuity, or inspiration. The figures do seem to indicate such a condition but contrasted with them is the fact that the most dramatic successes recently have involved a certain amount of individual design effort. This view is based on race winners in 56 and 57, when the chassis, at least, were built, or designed, by individuals not conducting business for the open market.

Selecting one detail of the above statistics, the Kurtis-Kraft model 500G2, whether actually the precursor of a package era or not, stands out as a most interesting little machine. It is smaller, lower, narrower, and lighter than its predecessors. Frank Kurtis advised that he built 14 of these new cars for this race. The fact that most of them actually qualified and started speaks well for their effectiveness.

Eddie Kuzma, of course, was represented in the race by one car which is comparable to the Kurtis 500G2—the Greenman-Casale entry. He also rebuilt the Dean Van Lines car into a similar unit. All of the more or less independent chassis builders worked toward a similar end — smaller, lighter, narrower, etc.

To this point, we have not referred to the rule change which reduced engine displacement to 255 cu in. from 274. As a matter of personal opinion, such reference is not really indicated. Ostensibly, the rule was changed to "reduce speeds." Perhaps someone involved in the process honestly thought

(*Turn to page* 164, *please*)

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POWERFUL
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TULSA®
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A complete line of low speed, medium speed, high speed, reversible, and three series of two speeds forward, reversible models for every truck requirement.
FEATURING: strong, light-weight housings; forged, heat-treated gears; heat-treated shifter yokes; anti-friction bearings throughout, shaved gear teeth; double-lip shifter shaft seals, extremely low prices, nationwide distribution and service.
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DIVISION OF VICKERS Inc.

WHY DOES A HOT VALVE GET TIRED?

Fatigue tests at 1500° F. will find out

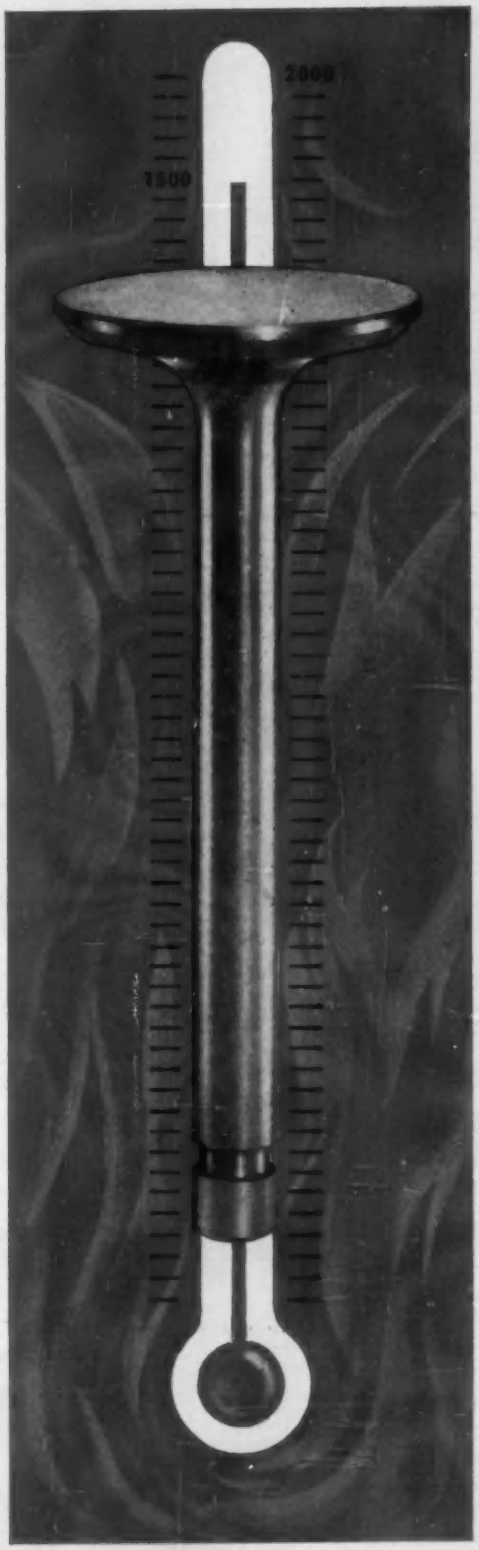
Accelerated fatigue tests on metal samples heated to 1500°F. can now be made at the Valve Division research lab on the special machine shown below.

The results of these tests help the Valve Division metallurgists develop new alloys and heat treatments to extend engine valve life even longer. Fatigue-induced breakage at the neck can be reduced. Valve designs that are least susceptible to fatigue at engine temperatures can be developed and quickly tested.

This is another example of Valve Division leadership in the development and production of valves for all types of engines and service requirements. Out of this leadership have come more than 1,000,000,000 valves for all leading engine builders.

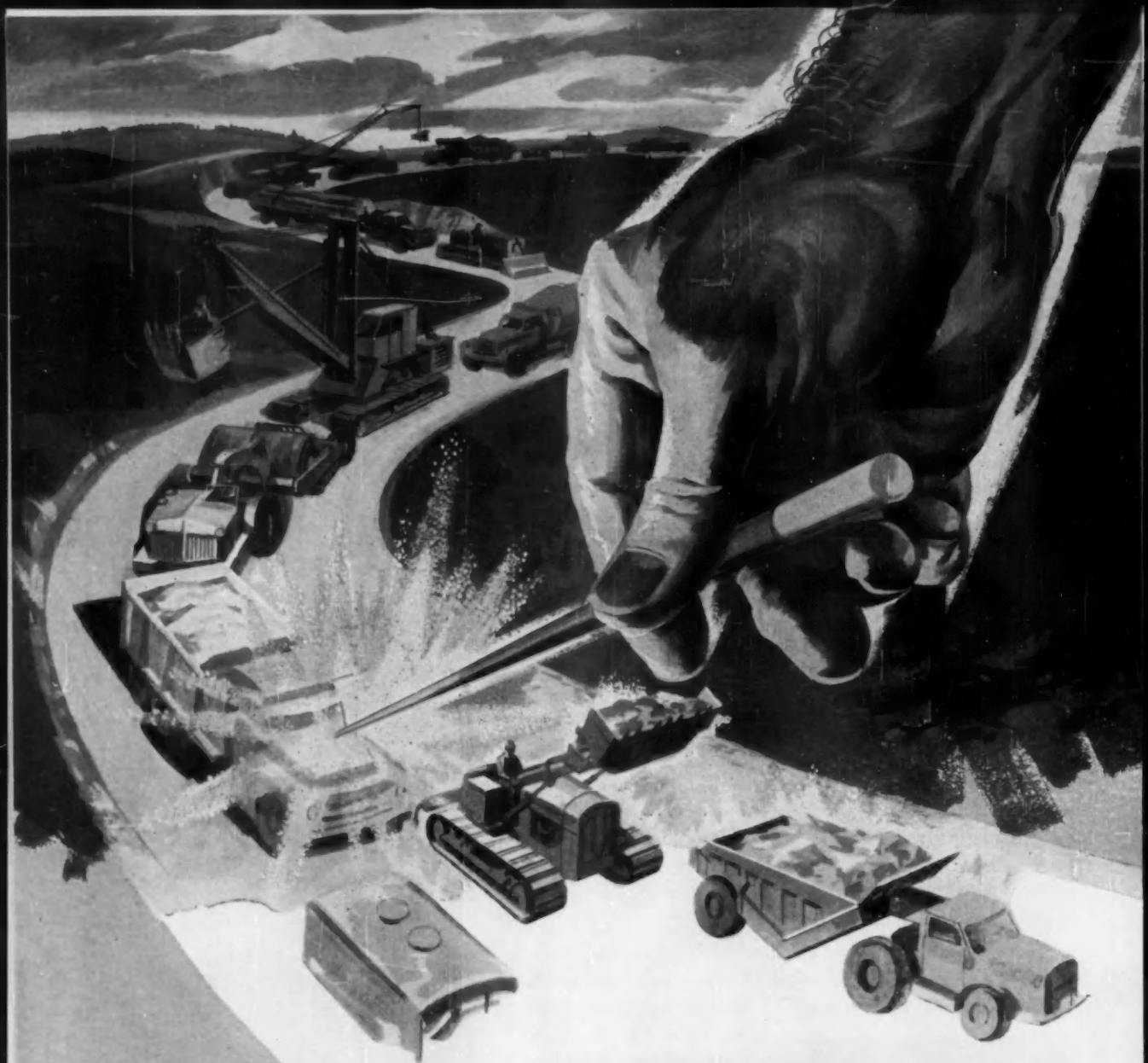


Constant-force fatigue machine with furnace and controls for elevated-temperature fatigue testing, at the Valve Division.



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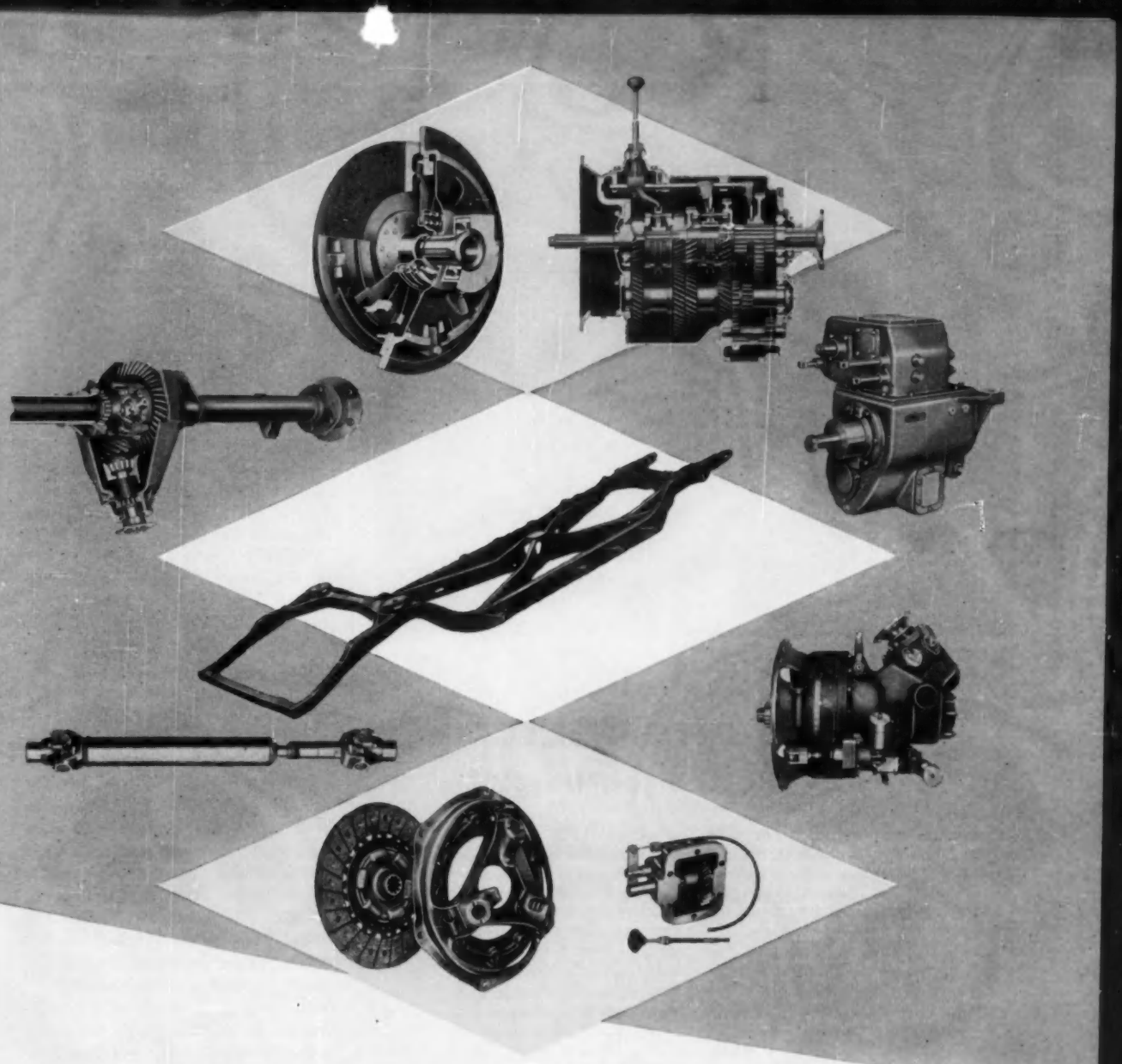
RAILROAD: Transmissions, Universal Joints, Propeller Shafts, Generator Drives, Rail Car Drives, Pressed Steel Parts, Traction Motor Drives.

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Many of these products manufactured in Canada by Hayes Steel Products Limited, Merritton, Ontario

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to work *in the construction industry*

In 1915, 1 million workers produced 5 billion dollars worth of new construction. In 1956, 4 million workers produced 62 billion dollars worth of new construction *. . . a 300% increase in productivity per man!*

Mechanization is the answer. *Mechanization* that pushes, pulls and hauls billions of tons of construction material with equipment using Dana Corporation products: **Spicer Clutches, Transmissions, Auxiliaries, Torque Converters, Universal Joints and Propeller Shafts, Axles, Power Take-Offs, and Frames.**

Dana has furnished power delivery equipment to every type of mechanized vehicle since 1904. Today there are 10 Dana Corporation plants strategically located in the United States with exceptional engineering and manufacturing facilities.

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Where else can

DUREZ PHENOLICS

do the job best?

This oil pump gear is another example of how a value analysis can indicate change-over to a Durez engineering plastic.

Chrysler Corporation engineers saved about two-thirds the cost of the former metal gear when they pioneered with Durez in developing this precision-molded plastic part.

Performance in withstanding the heat and friction created in automotive transmissions showed remarkable improvement. Molded of a glass-fiber-reinforced compound, Durez 16771, the plastic pump gear showed no performance-affecting wear after 200,000 miles. The same degree of wear was visible in the former part of metal at 70,000 miles. Noise reduction is another major achievement.

What makes Durez thermosetting phenolics so inviting to engineers in search of new and better materials, lower unit cost, faster assembly, and longer service? *Their properties are available in well-balanced combinations.* Electrically non-conductive, chemically inert, Durez withstands heat and impact, is unaffected by moisture, molds readily to any shape, and needs little or no finishing.

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HOOKER CHEMICALS PLASTICS

Still Faster Five Hundred

(*Continued from page* 160)

this result would actually ensue from the change. Very few informed individuals believed it would, and the race results speak for them. The only practical consequence of the new rule was the necessity for the driver to work a little harder in the turns in some cases. Obviously, this state of affairs cannot be defined as safety.

Viewed from the durability angle, the rule change to smaller engines could be interpreted as producing some benefits. In the list of causes for elimination of the respective cars which had to drop out of the race there were only, as this account was prepared, four engine failures! Of these, one was a broken valve; one was a piston failure said to have been caused by loss of water; one was supercharger trouble; and the fourth was a broken cam gear.

Other causes for elimination which stand out rather sharply were: two failures of fuel tanks—both on Kurtis-Kraft 500G2 cars which have welded aluminum tanks, cradle mounted; one clutch failure; one front wheel bearing failure; and a broken throttle.

Six cars were wrecked during the program, including two on the abortive start, and the yellow light was on for a total of approximately 30 minutes while the track was cleared. One car spun out (inside of track). It is a pleasure to state that no serious injuries were incurred by any of the drivers involved in the mishaps.

The track underwent several extensive improvements, including an attractive, modernistic "control tower" replacing the old traditional pagoda. A safety lane was built back of the inside wall to contain the pits and provide passage for cars into and through the pit area. A certain amount of confusion attended the use of this new feature but it doubtless will be corrected by next season.

This was one of the best shows ever run at Indianapolis. Even the pit work was by long odds the most

(*Turn to page* 169, *please*)



Blind assembly costs cut in half with SPEED GRIP® Bolt and Nut Retainers

A tip-in . . . a sidewise pull . . . and this new front-mounting SPEED GRIP Bolt and Nut Retainer is locked in the panel without special tools or skills.

The exclusive SPEED GRIP locking feature provides enough lateral drift to compensate for normal production misalignment of the parts to be fastened together.

Blind-panel assemblies no longer require awkward, time-consuming acrobatics for fastening. The problems caused by damaged threads in welded, staked, or clinched fasteners are eliminated. SPEED GRIPS can be slipped into place anywhere on the production line.

These convenient, time-saving SPEED GRIPS are available to fasten a wide range of unit sizes and bolt diameters to a variety of panel thicknesses. Ask your Tinnerman representative for samples and engineering data. All major telephone directories list your closest Tinnerman Sales Engineer. Or write to

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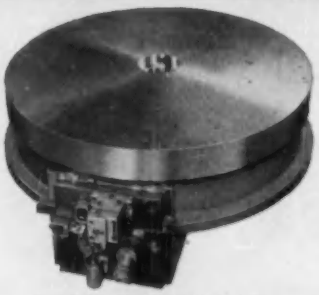
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Speed Nuts®



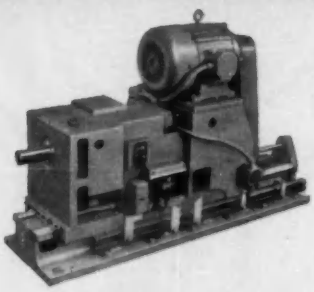
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STANDARD WAY-TYPE DRILL UNIT

for drilling, boring, reaming, counter-boring and chamfering. Single and multiple spindle arrangements, single or double feed rates.

KEARNEY & TRECKER TAKES OF PRODUCTION

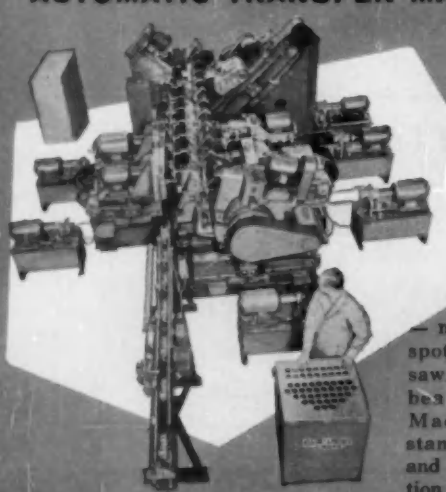
Here's a sound, proven *economical* approach to your production machine tool problems... Kearney & Trecker production machine tools featuring standardized components.

You get IMPORTANT SAVINGS — benefit directly three ways: (1) lower initial cost; (2) less lead time needed and (3) proven standard units mean efficiency *plus* simplified maintenance.

Ask the Kearney & Trecker man — he'll show you more examples of standardized machine components in production machine tools — the keys to capturing more profits from production!

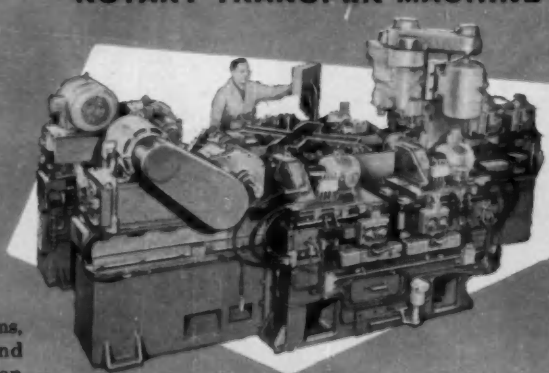
Integrated standard components meet

THIRTEEN STATION AUTOMATIC TRANSFER MACHINE



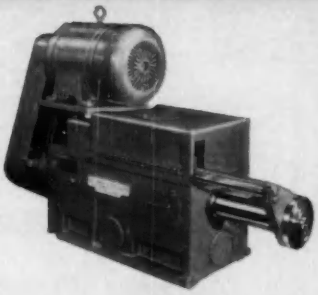
— mills, drills, reams, spot-faces, taps and saws apart cast iron bearing cap blocks. Machine includes 5 standard feed slides and standard production units.

FOUR STATION ROTARY TRANSFER MACHINE



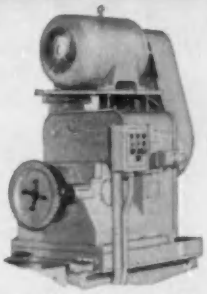
— New rotary transfer design permits machine to mill and center drill the ends and mill locating notches on crankshafts. Four standard feed slides, 3 standard production units are used.

ARE STANDARDIZED . . .



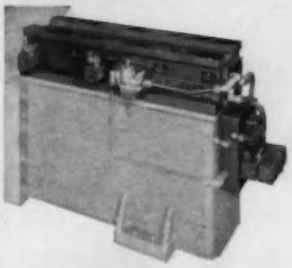
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for drilling, boring, reaming, spotfacing, counter-boring, chamfering. Single or multiple spindle arrangements — single or double feed rates.



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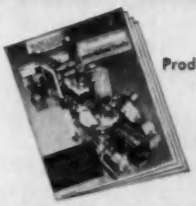
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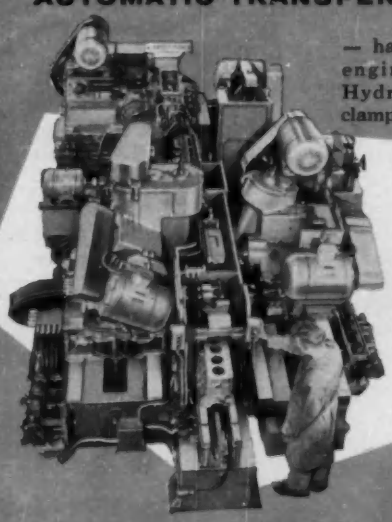
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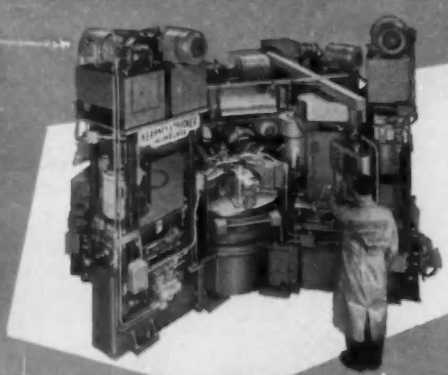
multiple machining requirements

SIX STATION AUTOMATIC TRANSFER MACHINE

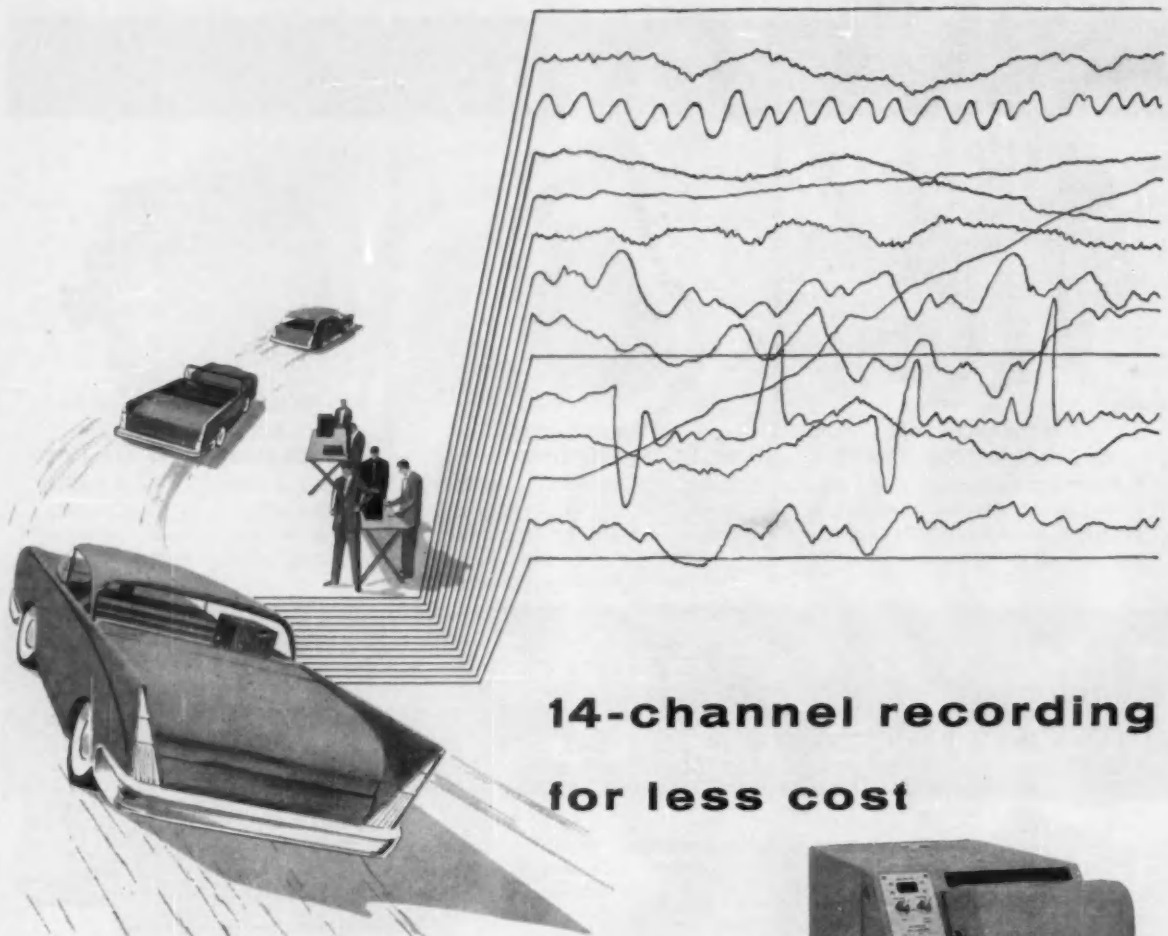


— handles two different engine cylinder blocks. Hydraulic locating and clamping fixtures are a feature of this Kearney & Trecker which mills the mounting pads, push rod cover face, ignition boss, fuel pump pad and ends of blocks. Machine has 2 standard feed slides — 4 standard milling heads.

SIX STATION ROTARY INDEXING MACHINE



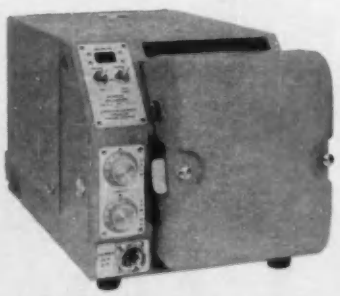
two such machines replaced six obsolete tools for a communications equipment manufacturer. Basically 70% standard, machines incorporate 7 Kearney & Trecker standardized components. Use of overhead hydraulic units saves floor space.



14-channel recording for less cost

CEC's Economical

5-116 RECORDING OSCILLOGRAPH



Compare this versatile, high-quality performance

Rugged enough for the roughest shock tests... inexpensive enough for any laboratory that needs to record large quantities of data simultaneously with positive time correlation, the CEC 5-116 provides a full range of frequency response found in larger, more expensive recording oscillographs. Fourteen channels are recorded and time-correlated on 5-inch wide paper or film. A governor-controlled motor and positive quick-change gears drive the recording material at ¼" to 100"/sec. speeds. Operates from either a-c or d-c. Automatic record-numbering and trace identification are standard. For complete data, contact your nearby CEC field office, or write for Bulletin CEC 1521-X14.

Consolidated Electrodynamics

300 North Sierra Madre Villa, Pasadena, California

OFFICES IN PRINCIPAL CITIES THROUGHOUT THE WORLD



YOU CAN SAVE TIME, TROUBLE AND COSTS with

Formed Tubes...

★ **Save Time**

We have a huge stock of dies and, when needed, tooling's fast. We also avoid delays by making our own electrically welded steel tubing, sizes from ⅝″ to 3″ OD.

★ **Save Trouble**

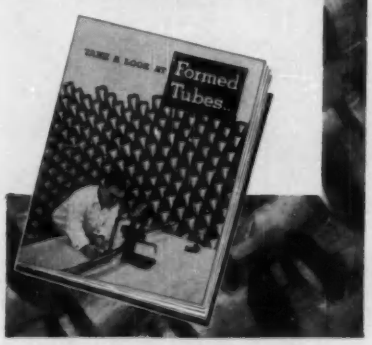
Long, active experience with all tube forming processes and high standards of quality control make sure your orders will be completed *right.*

★ **Save Costs**

It's routine for formed tubes parts to deliver top performance, save weight, cut costs. Steel, copper, brass, aluminum or stainless tubing fabricated in ⅜″ OD to 6″ OD sizes; from 20 to 11 ga. metal.

Formed Tubes, Inc.
603 Prairie, Sturgis, Michigan

Write for FREE Booklet



Still Faster Five Hundred

(*Continued from page* 164)

outstanding in the history of the race. The weather was near-perfect. Regretably, one cannot say as much for the organization. It was something less than superlative—much less. Weird was the only word for the start. But no doubt all these rough spots will be ironed out and next year will be OK.

Industry News

(*Continued from page* 94)

New Package Coil for Wire Put Into Use by U.S. Steel

Wire for reinforcing tire beads on automobile and tractor tires is now being shipped in a new package coil by American Steel & Wire Div., Waukegan Works, U. S. Steel Corp. Instead of being wound onto heavy steel reels, the 0.037-gage bronze-plated wire is wound onto a core of pressed paper, then packaged.

The tire wire is first wound onto an adapter reel, which is afterward taken apart and replaced by the paper core. Flat steel strapping holds the wire to the core.

After strapping, the flat sides of the adapter reel are removed, leaving a 1000-lb coil that can be handled easily with a lift truck. The coil is then wrapped with asphalt-center paper for protection in shipment, and strapped to a wooden pallet, two coils to the pallet.

The pallet then represents nearly a ton of wire, whereas the old system of winding onto reels produced a weight of about 750 lb of wire and about 120 lb of pallet.

$1.7 Million AF Contract Goes To Kaiser Aircraft

New contracts for production of more than $1.7 million in guided missile testing equipment are being awarded to the Toledo Electronics Division of Kaiser Aircraft & Electronics Corp.

Destined for use by the Air Force, test equipment allows technicians to make an automatic ground check of the operating characteristics of a missile before firing. The pre-flight "Go-No/Go" tester simulates functions of flight.



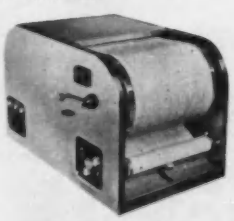
These CEC units complete your dynamic testing system...



1-118 CARRIER AMPLIFIER amplifies strain gage outputs to 600 cps with ±3% linearity. Four separate input channels may be individually adjusted to provide full-scale output from 1.875 to 64.000 mv signals. Bulletin CEC 1522-X9.



8-108 BRIDGE BALANCE allows direct coupling of strain gage or other resistive-type pickups to galvanometers in a recording oscillograph. Each input channel has separate balancing and excitation-voltage adjustments. Bulletin CEC 1560-X21.



23-109 OSCILLOGRAM PROCESSOR delivers a developed and dried record at rates of 10 to 15 feet per minute. Eliminates the need for darkroom and water connections. No experience required to operate. Bulletin CEC 1537-X26.

Consolidated Electrodynamics

300 N. Sierra Madre Villa
Pasadena, California

OFFICES IN PRINCIPAL CITIES THROUGHOUT THE WORLD



Integral Cam Programmer . . . Enables complete 1-to-24 hour program to be precast. Electric or pneumatic control on one or both pens.



Millivoltmeter Pyrometer—Vertical Case . . . Available in a variety of electric control forms.



Flame Safeguard Relay . . . Stops flow of fuel into combustion space when flame or ignition fails.



Millivoltmeter Pyrometer—Horizontal Case . . . Fits standard relay rack for easy mounting. Also available with dual set point.

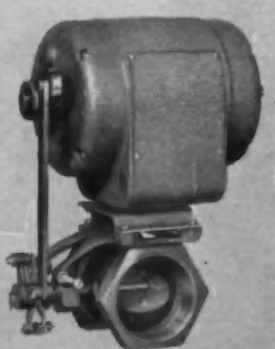
ONE



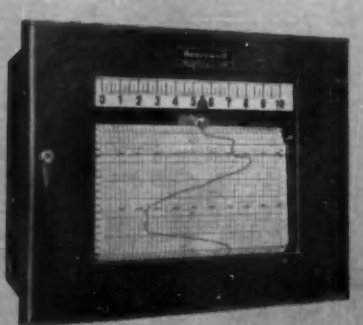
Radiation Detector . . . Responds to 98% of any temperature change within 2 seconds . . . high-speed model responds in half second. For applications from 200 to 7000F.



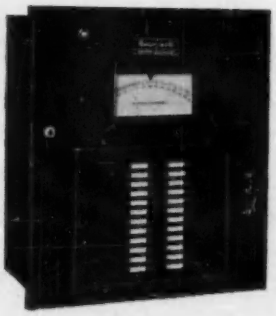
Circular Chart Program Controller . . . With integral cam index guide. Available with electric and pneumatic control forms.



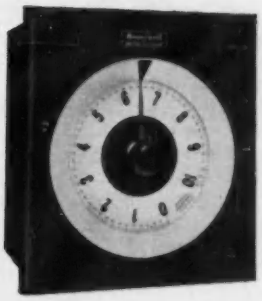
Heavy Duty Electric Motor . . . For operating valves, dampers, louvers and other final control elements.



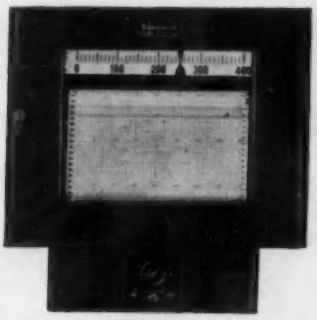
Strip Chart Recorder—Single or Multiple Point . . . Records all types of variables. Choice of pen speeds and chart speeds.



Precision Indicator—Circular Scale . . . Highly accurate indicator for all variables, one to 48 points.



Circular Scale Controller . . . Scale is over 2½ feet long. Control index rotates with scale for 12 o'clock control check. Available in all electric control forms.



Strip Chart Program Controller . . . Incorporates temperature indication, single or multiple recording, controlling—in one instrument.

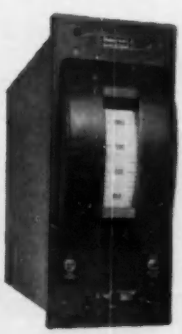
STOP shopping . . .

Whether it's temperature, pressure, flow, or any other important variable you want to measure or control, Honeywell makes just the instrumentation for you. Our line of instruments is as broad as your requirements . . . you can choose exactly what you need.

This means you get all the instrumentation you require from a single source, so there is undivided responsibility for the complete installation. And you are assured that equipment suggested for your process is recommended without bias. With a complete line there is no need to over-sell or under-equip.

For the new process, the modernization program, or a replacement problem, find out how Honeywell can go to work . . . anywhere in the metal processing industry. Get in touch with your nearby Honeywell sales engineer. He's as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.—in Canada, Toronto 17, Ontario.



Precision Indicator—Vertical Scale . . . Has drum-type power-driven scale. Full scale travel in 12 or 4½ seconds.

Honeywell

H HONEYWELL

First in Controls

MEN *in the* NEWS

(*Continued from page* 94)

Divco-Wayne Corp.—**Newton Glekel** was named president; **Frank W. Hall**, president of the Wayne Works and Miller-Meteor Motor Car Div.; **G. E. Muma**, president of Divco Truck Div.; **I. G. Brown**, vice-president of sales for all divisions; and Richard O. **Thomas**, general sales manager of Wayne Works Div.

National Lead Co., Magnus Metal Div. — **Edward M. Van Winkle** has been appointed general manager.

Olin Mathieson Chemical Corp., Western Brass Mills Div.—**C. Donald McLain** is now research and development manager.

La Salle Steel Co.—**Howard McMinds** has been appointed manager of industrial relations.

Westinghouse Electric Corp. — **Joseph F. Craig** has been appointed area manager in the Detroit district office.



Associated Spring Corp.—Owen D. Nee and Wallace Barnes were elected treasurer and secretary, respectively.

U. S. Rubber Co., Tire Div.—**J. Chester Ray** was made director of customer relations.

Besly-Welles Corp. — **J. Waldron Julian** has been elected assistant treasurer.

Continental Motors Corp., Research and Development Div.—**Laurence D. Bakke** has become production manager for small military standard engines. **Granville R. Conrad** succeeds him as chief engineer. **Stanley R. Ellingham** is now assistant chief engineer, and **Basil D. Johnson** has been advanced to executive assistant to the vice-president.

Clark Equipment Co.—**Malcolm G. House** is now manager of industrial relations research.

GMC Truck & Coach Div., General Motors Corp.—**E. W. Jolly** is now truck fleet sales manager.

Baldwin-Lima-Hamilton Corp.—**Perry A. White** was named to the board of directors.

Michigan Tool Co., Machine & Tools Div.—**Henry S. Harrison** has been made plant superintendent.

Greer Hydraulics, Inc.—**B. R. Teree** has been elected vice-president in charge of engineering and manufacturing.

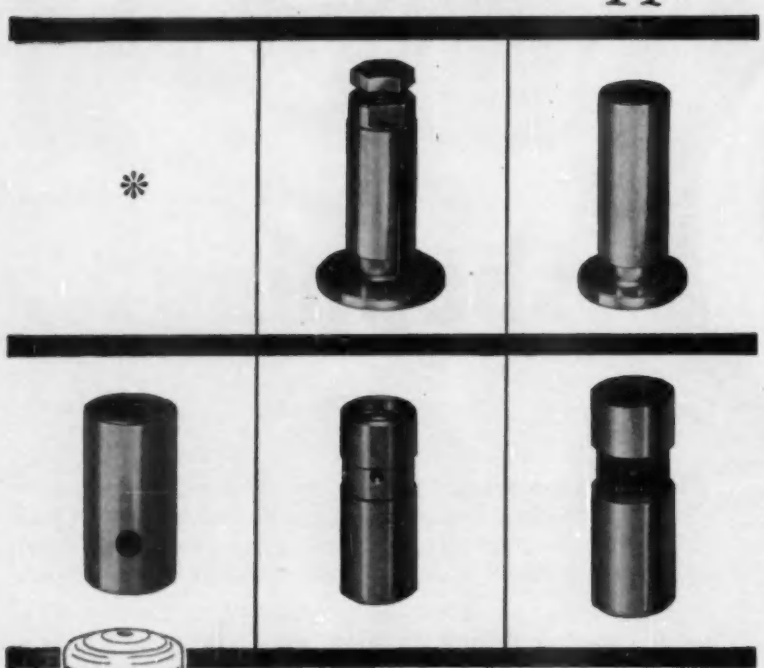
Hall-Scott, Inc.—**Robert A. J. English** was elected president and a director.

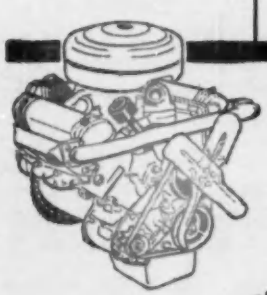
General Motors Acceptance Corp.—**Van Buren Thorne, Jr.**, has been named assistant director of public relations.



Budd Co.—James B. Seelye and F. Walter Norcross, Jr., were elected secretary and treasurer, respectively.

JOHNSON *tappets*





keep pace with today's engines

Continual experimentation and excellent manufacturing methods show a steady product improvement that make JOHNSON TAPPETS worthy of your consideration. Only proven materials, covering a range of steel, chilled iron, and various iron alloys are used in the manufacture of JOHNSON TAPPETS, providing greater strength, light weight and increased wear resistance. Serving the AUTOMOTIVE — AIRCRAFT — FARM — INDUSTRIAL — MARINE Industries.

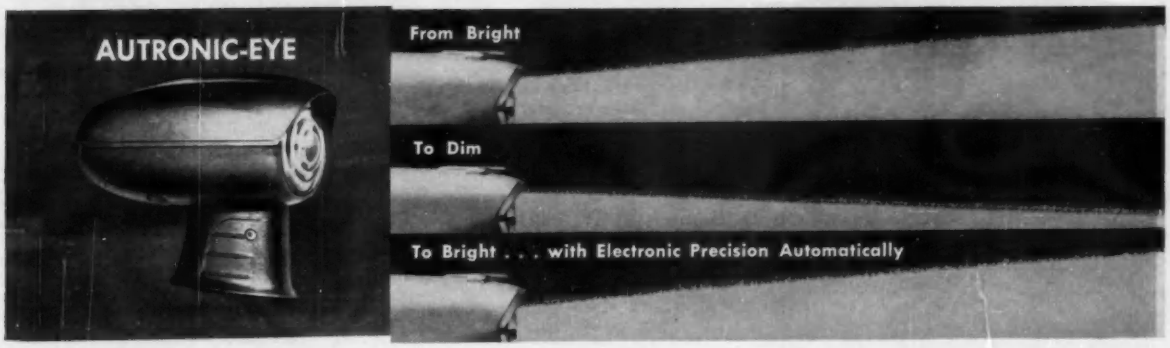
"tappets are our business"

JOHNSON JP PRODUCTS

MUSKEGON, inc. MICHIGAN

Guides TO SAFER NIGHT DRIVING
FOR 1957 GENERAL MOTORS CARS

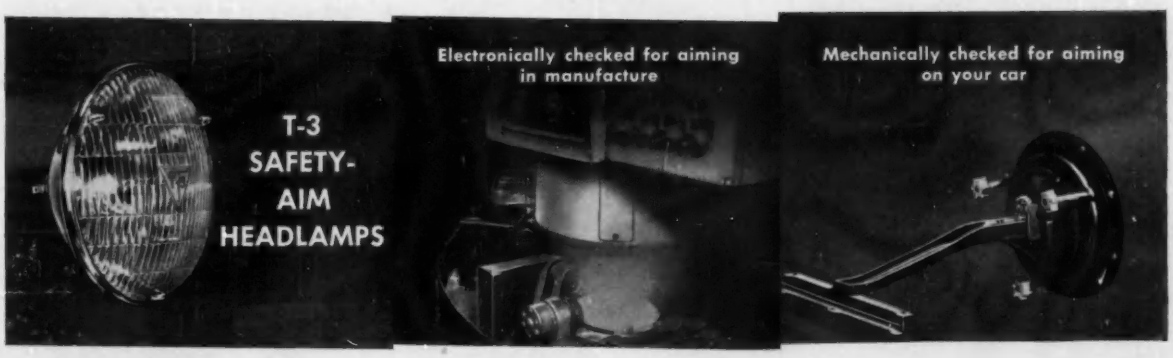
Autronic-Eye available at extra cost. View-Finder Mirror standard on some models . . . available at extra cost on others. T-3 headlamps standard on all models.



automatically operates your headlamps . . . you devote full attention to the road ahead!



reduces blinding rear view headlamp reflection . . . with fingertip control!



assures more light aimed right . . . essential for safe night driving!

BRIGHTEST NAME IN LIGHTS Guide

GUIDE LAMP DIVISION GM **GENERAL MOTORS CORPORATION • ANDERSON, INDIANA**



Panalarm Annunciator pinpoints process "off-normals"

In the process industries and among users of automatic machinery, trouble is minimized when it's caught early. That's the purpose of the Panalarm Annunciator System — a continuous monitor of your process.

One typical adaptation of the modular Panalarm system is engineered to differentiate between the first "off-normal" and subsequent "off-normals" caused by the first. This feature allows instantaneous recognition of the prime source of trouble in a "chain reaction."

Another adaptation is designed specifically for motor start-up and shut-down. It has also been successfully adapted for supervisory control, pump control and programming.

Your Panalarm sales engineer will be happy to make a survey of your requirements to determine whether a Panalarm system can aid productivity and safety in your process. For electrical and mechanical data on standard systems, request Catalog 100B on your letterhead.

PANALARM

Division of
PANELLIT. INC.
7503 N. Hamlin Avenue, Skokie, Illinois
Panellit of Canada, Ltd., Toronto 14

Engineered Information Systems for Industry



Graphic Panels, Control Centers | Panalog Information Systems | Panellit Service Corporation

AI TABLOID

(*Continued from page* 94)

Ryan Aeronautical Co. has acquired an assembly plant and 27-acre industrial site adjacent to the Torrance, Calif., Municipal Airport.

* * *

Research Engineering Services Corp. is name of new firm formed in Sandy Springs, Ga., to engage in aeronautical contract engineering activities.

* * *

General Electric Co. is building a new $500,000 furnace facility for its Small Aircraft Engine Dept. at Everett, Mass.

* * *

B. F. Goodrich Co. has purchased 20 acres of land near Wilkes-Barre, Pa., for the site of a new textile processing plant.

* * *

Stockholders of Kaiser Industries Corp. have approved the merger of J. A. McEachern Investment Co. into Kaiser Industries Corp.

* * *

Atlas Corp. has agreed to merge its wholly owned $7 million aircraft service subsidiary—The Babb Co., Inc.—into Transocean Corp. of California.

* * *

Goodyear Tire & Rubber Co. is producing Tri-Metalic disk brakes and cast wheels for the Fairchild F-27 Friendship project transport plane.

* * *

Raytheon Mfg. Co. has taken over management of the Navy's industrial plant in Bristol, Tenn., for production of the Sparrow III missile.

* * *

M. L. Aircraft Co., Ltd., of England has developed a tiny new family plane with an inflatable wing.

* * *

Fischer & Porter Co. has signed a license agreement with the Hokushin Electric Works of Tokyo, Japan.

* * *

Reinforced Plastics Div. of the Society of the Plastics Industry has released a new color film, titled "Designing With Reinforced Plastics"

MECHANICAL ENGINEERS WANTED!

Development work on PRESTONE BRAND ANTI-FREEZE

How knowledgeable are you on heat transfer in cast iron or aluminum engines? What about relating engine performance on the dynamometer to actual road test data?

Interested? These are some of the projects relating to PRESTONE being conducted at our engineering center at Tonawanda, New York. Other projects range from evaluations of new automotive products such as gasoline and oil additives to development of new test procedures for high output automotive engines.

Because this is one of the major research and development centers of Union Carbide Corporation, an exceptionally wide range of technical facilities are available. Working conditions are pleasant in the modern technical center, staffed by more than 350 creative men of scientific background. The salary program is liberal, and complete employee-benefit plans are in effect.

Men with Bachelor or Master Degrees, with a high degree of individual creativeness and initiative, are required. Please send a summary of your educational background and work experience to Mr. R. P. Kalle, Dept. MEA, Linde Company, Division of Union Carbide Corporation, P.O. Box 44, Tonawanda, N. Y.

50 YEARS OF LEADERSHIP

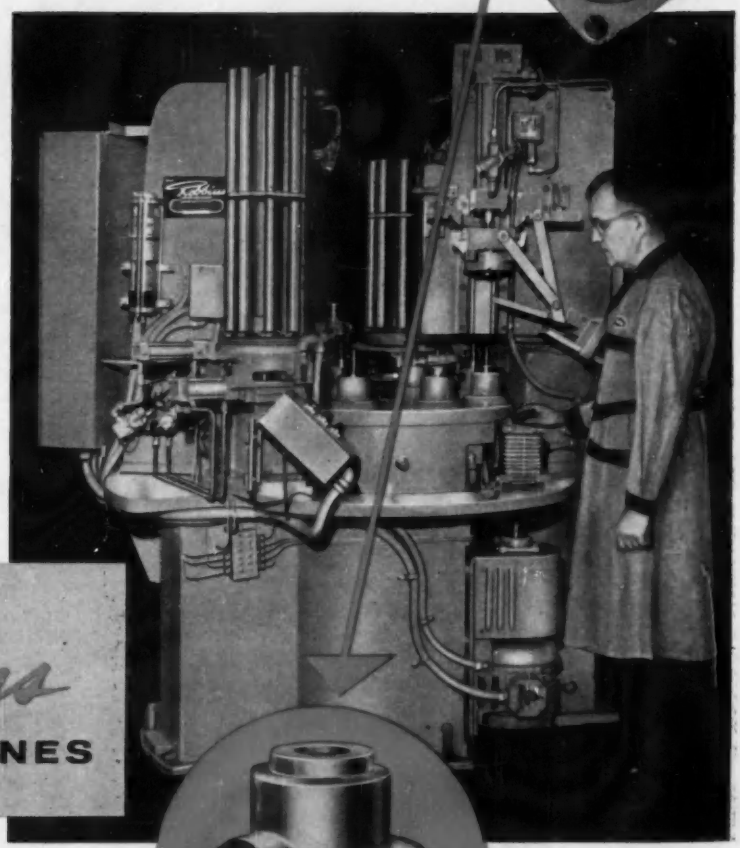
Linde UNION CARBIDE

The terms "LINDE," "PRESTONE" and "UNION CARBIDE" are registered trade-marks of UCC.

720 Assemblies Per Hour AUTOMATICALLY!

This Robbins "Assemblimatic" feeds, positions, assembles and unloads automatically . . . producing 720 four-piece assemblies every hour! It assembles a needle bearing, washer and seal in two sizes of a steering gear end cover. Parts are fed and positioned from indexing magazines, and completed assemblies are removed and placed on a conveyor . . . all automatically.

Machine features include: (1) Robbins panel, one-third standard size, with plug-in aircraft type relays and controls which prevent assembly unless parts are correctly positioned, (2) Index table with both barrel type cam and shot bolt for accuracy and magnetic operation of index and dwell, (3) Positive dwell time control through synchronous timer and electrical interlock at each station, (4) Hardened and ground ways, (5) Automatic lubrication, (6) Electrical and pneumatic equipment to J.I.C.



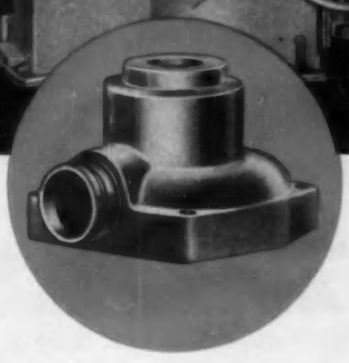
Robbins special assembly machines save manpower, speed production and improve quality, often combine machining with assembly for further savings. Automatic inspection, selection, orientation, assembly and in-process gaging assure consistent high quality production. Ask us for recommendations to help solve your automatic assembly or machining problem.

OMER E. ROBBINS COMPANY
24798 PLYMOUTH ROAD • DETROIT 39, MICH.

Robbins
SPECIAL MACHINES



New brochure describes and illustrates a variety of Robbins special assembly machines. Write for your copy.



More Government Contract Awards

THIS latest list of Government prime contracts that have been awarded covers the period from April 30 to May 28, 1957. Items included in this list are for various types of automotive military equipment, including tanks, motorized gun carriages, trucks, airplanes, automotive components and spare parts, automotive maintenance equipment, etc.

AEROQUIP CORP., Jackson, Mich.
Hose assembly—4435—$154,393

AINSWORTH MFG. CORP., Detroit, Mich.
Automotive spare parts—4422—$290,462

AIR ASSOCIATES, INC., Teterboro, N. J.
Aircraft accessory spare parts—42—$116,053

AMERICAN BRAKE SHOE CO., Kellogg Div., Rochester, N. Y.
Compressor, air, gas. engine driven—956, compressor, air, electric motor driven—25—Total $273,207

AVCO MANUFACTURING CORP., Lycoming Div., Williamsport, Pa.
Aircraft engines for H-13H aircraft—$242,730
Special tools & equip. for 0290 G series aircraft engines—6—$106,101

BATTERY PRODUCTS CO., Oakland, Calif.
Automotive storage batteries—indef. qty.—$53,500

BEECH AIRCRAFT CORP., Wichita, Kans.
L-23D airplanes—$300,000

BENDIX AVIATION CORP., Bendix Products Div., South Bend, Ind.
Spare parts for landing gear strut assy applicable to F84, B25, T29, and C131A aircraft—$79,640

BENDIX AVIATION CORP., Eclipse-Pioneer Div., Teterboro, N. J.
Production prototype B-52D trainer type MN-8—$176,663

BENDIX AVIATION CORP., Zenith Carburetor Div., Detroit, Mich.
Repair parts, carburetor, gaskets, head—135 items—$34,213

BOEING AIRPLANE CO., Wichita, Kans.
Modification and proto-typing of one B-47 airplane into KB-47 tanker configuration—job—$887,000
Modification of 3 B-47E type aircraft—job—$74,699

BOWERS BATTERY & SPARK PLUG CO., Reading, Pa.
Automotive storage batteries—indef. qty.—$175,000

BUTLER MANUFACTURING CO., Kansas City, Mo.
Truck, tank, oil servicing—241—$2,256,-993

CANFIELD TOOL AND DIE CO., Wayne, Mich.
Replenishment parts—5833—$134,451

W. S. CARLEY & CO., Washington, D. C.
Fire truck bodies—28—$94,383

CATERPILLAR TRACTOR CO., East Peoria, Ill.
Generator set, diesel engine driven, 150kw, ac, wheel mounted for electrical support of F-102 & F-101 aircraft—$2,300,400
Tractor, wheeled and track laying—13—$270,512
Generator set, electric—66—$1,549,076

CESSNA AIRCRAFT CO., Wichita, Kans.
L-19E airplane—$429,916
L-27A airplane—$2,534,562

CONTINENTAL MOTORS CORP., Muskegon, Mich.
0-470-15 engines for TL-19D aircraft—$1,036,729

CHICAGO PNEUMATIC TOOL CO., New York, N. Y.
Furnishing 4 500-kw Diesel engine generator units & auxiliaries—job—$242,-000

CHRYSLER CORP., Detroit, Mich.
Automotive spare parts — $1,183,763—modification

CHRYSLER MOTOR CORP., Washington, D. C.
Trucks—20—$50,435

CHRYSLER CORP., Airtemp Div., Dayton, Ohio
Range finder—925; ballistic computor—920; ballistic drive—995—$3,782,738

CLARK EQUIPMENT CO., Industrial Truck Div., Battle Creek, Mich.
Trucks—3—$12,912

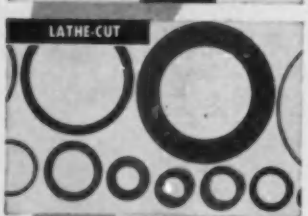
CONTINENTAL MOTORS CORP., Detroit, Mich.
Gage engineering agency services for 402 engines—$193,216

(*Turn to page* 181, *please*)

GOSHEN
RUBBER
PARTS AND COMPONENTS

... from NATURAL, SYNTHETIC and SILICONE RUBBER COMPOUNDS "Custom Made" to your exact specifications by Goshen Rubber







Whether your part is of complex design, or requires materials and properties to overcome severe conditions involving high or low temperatures, fluids, gases, flexing, abrasion, or friction, put Goshen Rubber to work for you. Small parts are a specialty . . . compression or transfer molded, bonded-to-metal or precision cut . . . to critical tolerances. You'll find Goshen a reliable source, too, for O-rings of compounds meeting MIL, AMS, SAE, ASTM and industrial specifications, in MS, AN, SAE, JIC and NAS standard sizes, plus many non-standard sizes and special shapes.

We'll be glad to review and quote on your needs . . . in confidence and without obligation.

SEND FOR BROCHURE

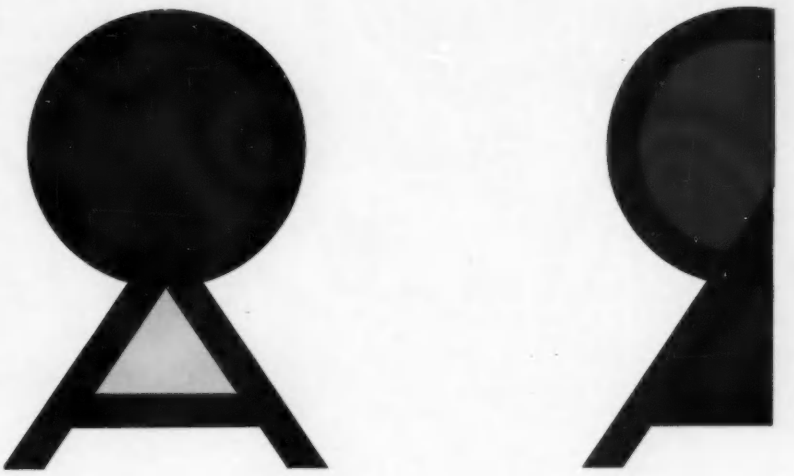
This 8-page brochure and technical bulletins tell how you can put Goshen Rubber to work for you. Send for your free copies today!



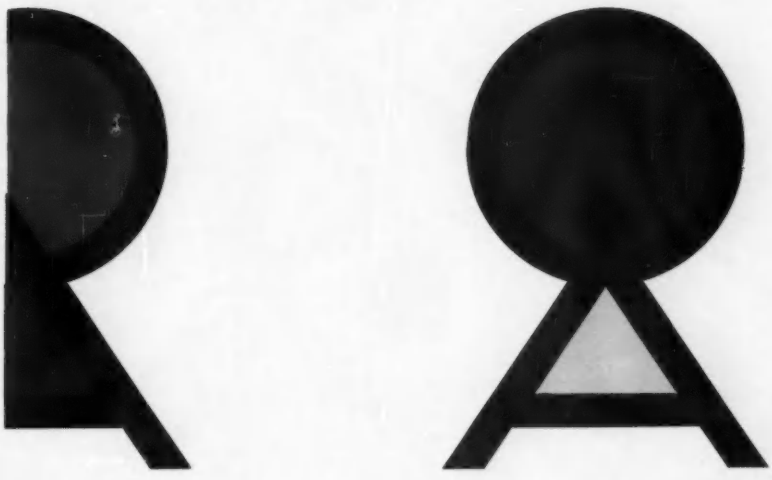
See our catalog in Sweet's Product Design File.

PUT Goshen Rubber TO WORK FOR YOU

GOSHEN RUBBER CO., INC., 2767 S. TENTH ST., GOSHEN, IND.



Symbol of a new concept of service standards in the Aluminum Industry



OLIN ALUMINUM's full integration means dependable delivery for you

Olin Aluminum is already in production, and soon an initial annual capacity of more than 240 million pounds will be a reality! Thus, from an investment of over 300 million dollars, a fully integrated operation is emerging — complete from new ore ships to Rolling Mills and Extrusion Plants.

Guiding this entrance of Olin Mathieson Chemical Corporation into Aluminum has been a firm determination to develop the most modern, technically advanced production facilities. And now, the full integration of these facilities, plus Olin Mathieson's extensive experience in non-ferrous metals, promises you a new standard of quality and service unique in the Aluminum Industry.

Olin Aluminum, produced with such ultra-modern facilities, will be of the finest quality — custom-made to your needs. But even more important, our full integration plus our established principles of doing business will mean greater assurance of on-time fulfillment of every commitment to you. Behind this assurance will stand the full-time assistance of imaginative technical and service staffs — people chosen for experience we feel to be unexcelled in the Aluminum and metals field.

Soon, the men from Olin Aluminum will be coming your way to tell you more about us. Meanwhile, we welcome inquiries. Write to: Aluminum Division — Sales, Olin Mathieson Chemical Corporation, 460 Park Avenue, New York 22, N. Y.

OLIN ALUMINUM

AND "OLIN ALUMINUM" ARE TRADEMARKS

TECHNIQUES and DEVELOPMENTS in oscillographic recording

FROM SANBORN

RECORDING METHOD USED IN SANBORN DIRECT WRITERS, AND A REVIEW OF THEORETICAL AND ACTUAL ERROR FACTORS

Figure 1 shows the basic scheme by which Sanborn oscillographic recording galvanometers produce graphic records of electrical signal values. If the rapid deflection action of the heated ribbon tip stylus is visualized when current flows in the coil, it can be seen that a straight line at right angles to the chart length is recorded on the chart, at the point where the chart is drawn over a knife edge. The trace, therefore, is a true rectangular co-ordinate graph.

Since this is essentially a process of expressing coil (or stylus) deflection *angles* in terms of *distances* on a chart, the trigonometry of the situation (Fig. 2) must be examined to ascertain the accuracy of the method. Initially, and when θ is small, the tangent and the angle are almost equal numerically. The expression $D = R \tan \theta$ can, therefore, be rewritten $D = R\theta$ (approx.). To the extent this latter expression is true, deflection distances (rather than deflection angles) are an accurate measure of signal values. But to determine the extent of error resulting from using this approximation, the following data have been calculated*, using a chart width of 25 mm either side of zero ("D" in Fig. 2) and effective stylus length of 100 mm ("R" in Fig. 2) in the series expansion for the tangent function. Error as a function of deflection then becomes:

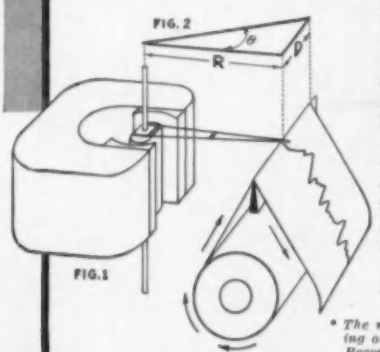


FIG. 1

D mms	Radians	Theoretical Error ϵ	Corrected Error δ	Corrected Error in mms
10	.10	.0033	0	0
15	.15	.0075	.004	.06
20	.20	.0133	.010	.20
25	.25	.0209	.018	.45

When the recording system is calibrated, that calibration is often made on the basis of a one centimeter deflection from the chart center, or by means of a two centimeter deflection starting one centimeter below chart center and finishing one centimeter above chart center. In either case the deflection at one centimeter from chart center is accepted as the standard, and, therefore, is without error. The foregoing table can therefore be corrected by subtracting .0033 from each of the error terms to show the error, δ, to be expected in actual use. The final column in the table shows this error in mms.

Since the active length of the stylus increases as θ increases, deflection D increases more rapidly than θ. All positive error terms in the series expansion bear this out, but the error terms would occur as predicted only if the galvanometer produced deflections exactly proportional to coil currents (that is, ideal spring properties in the torsion rods and uniformity of magnetic field). Pole tips in Sanborn galvanometers are proportioned so that in maximum deflections, galvanometer sensitivity *decreases* slightly, the compensation resulting in *actual* linearity better than that predicted in the table.

* *The mathematics involved here, as well as a discussion of fixed length stylii, design parameters affecting over-all galvanometer performance, etc., are contained in an article by Dr. Arthur Miller "Sanborn Recording Galvanometers," published in the May 1956 Sanborn RIGHT ANGLE. Copies are available on request.*

RECOGNIZE A "150" RECORD BY THESE *THREE* FEATURES...

1% Linearity

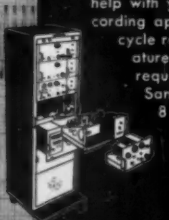
. . . resulting from use of current feedback Driver Amplifier in each channel, high torque galvanometers of new shorted coil frame design. Coil current of 10 ma develops 200,000 dyne cm torque, sensitivity is 10 ma/cm deflection.

Rectangular Coordinates

. . . save analysis time, simplify interpretation and correlation of multi-channel records. No waveform curvature, negative time lines, etc.

Permanent Inkless Traces

. . . made by hot nichrome ribbon tip of stylus on heat-sensitive Sanborn Permapaper. Clear, smudge-proof traces that clearly reveal minute signal changes.



Call on Sanborn engineers for help with your oscillographic recording application in the 0-100 cycle range. Descriptive literature is also available on request, providing data on Sanborn 1-, 2-, 4-, 6- and 8-channel Systems, choice of 12 interchangeable plug-in Preamplifiers, Separate and Supplementary Instruments.

SANBORN COMPANY
Industrial Division
175 Wyman Street, Waltham 54, Mass.

This Month's

GEAR PIX

Announcing

A NEW HIGH-SPEED TANDEM GEAR HOBBER

a new concept . . .

. . . supplies the answers to gear production problems. It's Michigan Tool's newest, the Tandem High-Speed gear hobber, Model 1433. A machine that can be set up in tandem or in-line series to tailor gear output to needs. The 1433 will precision hob spur gears up to 12 pitch or helical gears up to 30° helix. Center distance between hob arbor and work spindle is 3½ inches. Maximum crossfeed stroke is 4 inches.

. . . a new dimension

This new hobber lends itself to any degree of automation. Blanks may be supplied from an overhead distribution system. A common sub-base—in any length or configuration—provides parts removal from any number of machines. All machine services including the master panel and electrical connections are self-contained as part of the basic "building-block." Sub-bases are readily joined side by side to any length for any production rate.

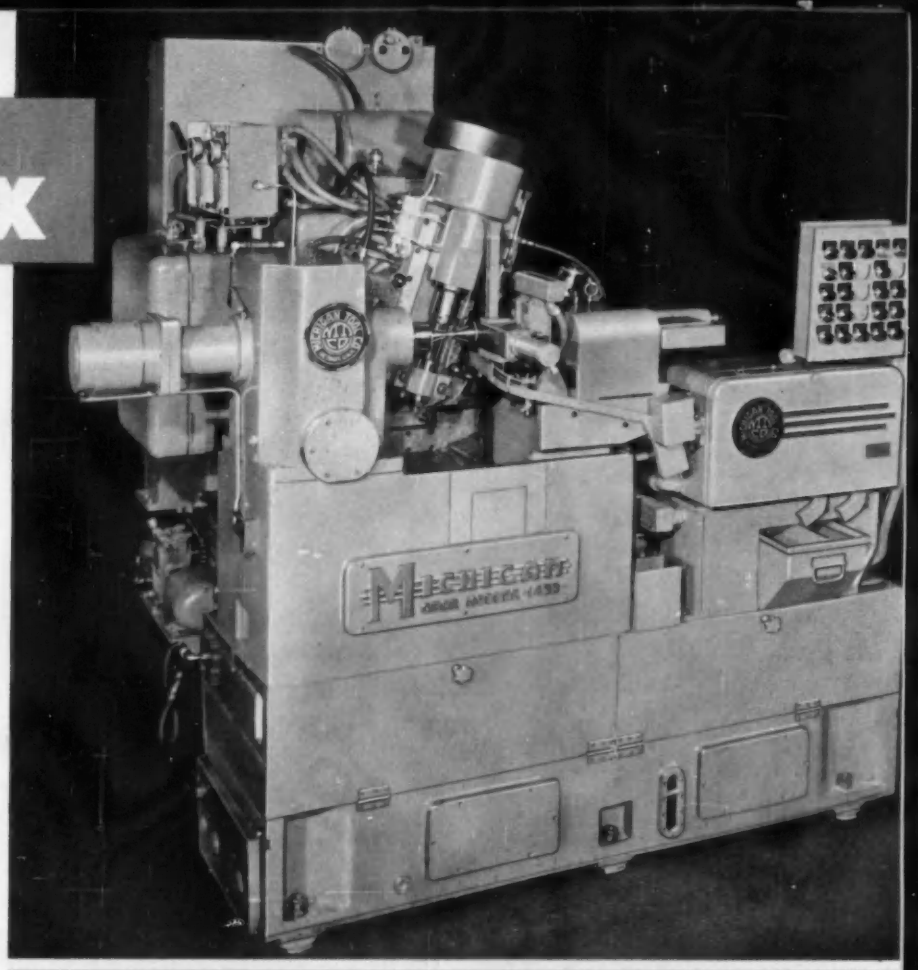
. . . a proven principle

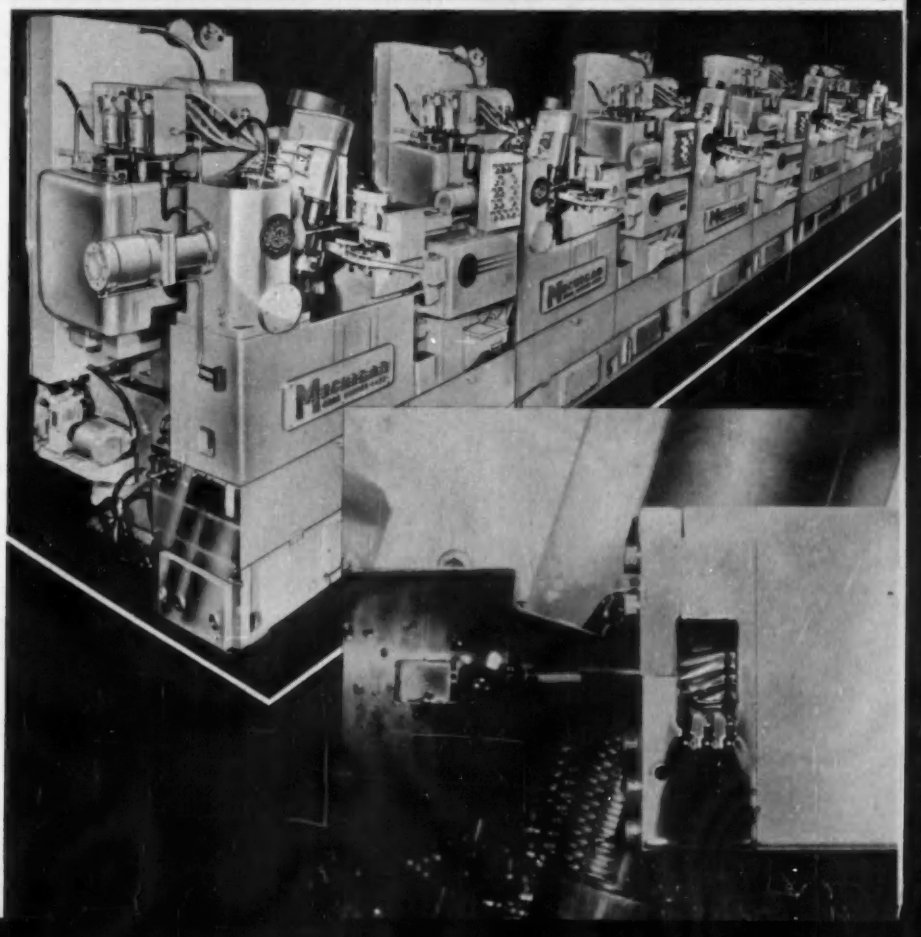
The 1433 single-spindle hobber features "plunge" or standard cutter feed, vernier-scale helix angle setting and an automatic expansion arbor for workholding. Set up is fast and simple. Hob speeds range up to 500 rpm—hob feed is infinitely variable. Automatic size control is also provided. Cut gears, automatically unloaded, are air-blast cleaned and automatically checked.

For complete information on Michigan's Tandem gear hobber, write for Bulletin TH-33.

MICHIGAN TOOL COMPANY

7171 E. McNICHOLS RD. • DETROIT 12, MICH.
IN CANADA: COLONIAL TOOL CO., LTD.





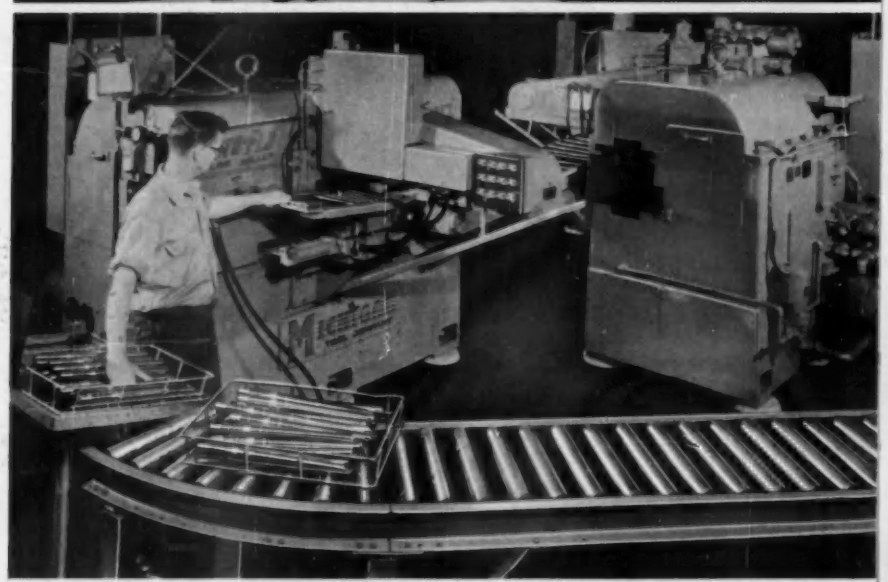
This Month's

GEAR PIX



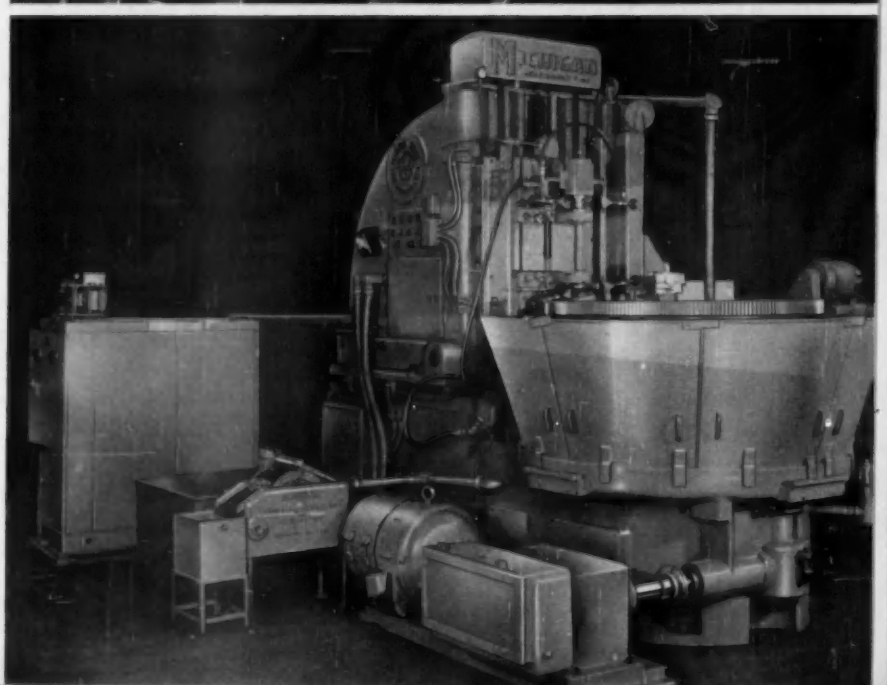
CUTS TWO PD's IN ONE SETUP WITH SAME TOOLS ▶

A new two-stage Shear-Speed gear shaper does the job if you have a part (such as a two-step clutch) requiring two different pitch diameters. It eliminates second setups. The two sets of teeth are cut in sequence (the deeper teeth first) with the machine cutting head locked in two different positions. Differential tool feed takes care of the PD's. Work cycle is automatic. All Shear-Speeds in the 1800 series can be so modified. We'll be glad to fill you in on details.



285 SHAFTS PER HR TRI-SPLINED BY "CHIPLESS MACHINING" ▶

Three different involute splines are cold formed on a transmission shaft in this trio of Michigan Roto-Flo machines. Transfer devices make the setup fully automatic after the first station. The method also offers long tool life and added product strength. More information is available in our Bulletin RF-55. Write for it.



HIGHER PERFORMANCE WITH IMPROVED GEAR SHAVER ▶

An improved Michigan Gear Shaver, Model V-48, cuts spur, spiral or herringbone gears up to 4 ft. P.D. It features full-range drive using only two sets of change gears and an integrated spiral pitch checker. Speeds and feeds are completely variable. Literature available soon.

MICHIGAN TOOL COMPANY

7171 E. McNICHOLS RD. • DETROIT 12, MICH.
IN CANADA: COLONIAL TOOL CO., LTD.

More Government Contract Awards

(*Continued from page* 176)

COPCO STEEL & ENGINEERING CO., Copco Trailers Div., Center Line, Mich.
Semitrailer, cargo 6 ton, 2 wh.—165—$441,412

CUMMINS ENGINE CO., INC., Columbus, Ind.
Generator set, electric—56—$966,392

DANA CORP., Toledo, Ohio
Transmission assy for truck, cargo, 2½ ton 6x6—$389,305

DETROIT BEVEL GEAR CO., Detroit, Mich.
Shaft, propeller, w/universal joint assy.—4538—$49,918

DIAMOND T MOTOR CAR CO., Chicago, Ill.
Truck, chassis, w/cab, 5 ton, 6x4—5—$28,301

ELECTRIC AUTO-LITE CO., Toledo, Ohio
Automotive storage batteries — indef. qty.—$402,000

FAIRCHILD ENGINE & AIRPLANE Corp., Stratos Div., Long Island, N. Y.
Turbine drive assys. repair parts—various—$248,889

FAIRCHILD ENGINE & AIRPLANE CORP., Wyandanch, N. Y.
Design, develop, and fabricate radar signal interference trainer—$190,412

FIRE MASTERS CORP., Mt. Clemens, Mich.
Fire truck—1—$20,773
Truck, fire-fighting, structural-brush-grass—4—$44,220

FIRESTONE TIRE & RUBBER CO., Akron, Ohio
Tire, 6.00x16—3164—$36,955
Automotive storage batteries — indef. qty.—$24,000

FIRESTONE TIRE RUBBER CO., Los Angeles, Calif.
Concurrent repair parts for Corporal missile—job—$234,048

FORD MOTOR CO., Dearborn, Mich.
Spare parts for XM 151E1 and XM 151E2 vehicles—$245,006

FORD MOTOR CO., Ford Div., Dearborn, Mich.
Automobiles, sedans & station wagons—various—$56,179

FORD MOTOR CO., Ford Div., Livonia, Mich.
Truck, panel, ½ ton, 4x2—25—$33,095
Truck, ¾ ton, telephone utility, maint.—217—$474,314
Bus, B.O.C., 37 pass., 4x2—45—$205,400

FORD MOTOR CO., Ford Div., Washington, D. C.
Trucks—291—$465,934
Station wagons—11—$19,689
Automobiles—11—$15,765

GARRETT CORP., AiResearch Mfg. Co. Div., Phoenix, Ariz.
Starters, combustion, aircraft engine for KC-135A aircraft—$373,673
Air turbine starters—$79,499
Power unit, AGS turbine, airborne—215—$3,923,440

GAR WOOD INDUSTRIES, INC., Wayne, Mich.
Trucks, bomb service—various—$1,608,-294

GENERAL DYNAMICS CORP., Convair Div., San Diego, Calif.
Airplanes, model R4 and 2—$1,237,918

GENERAL ELECTRIC CO., Erie, Pa.
Generators, ac; regulators, voltage; controls, generator, automatic for F-101B aircraft—$709,536

GENERAL ELECTRIC CO., Dallas, Texas
Aircraft accessory spare parts—9 items—$409,172

GENERAL MOTORS CORP., Allison Div., Indianapolis, Ind.
Special tools for J-33, J-35, J-47 and J-71 Engines—38—$35,288
XTG 410-1 Transmission, final drives and spare parts—6 ea. and various—$321,000
Overhaul and repair of J-35 jet engine components—job—$70,015
Transmission, TX200—30—$28,706
Design & development of XT-90 type transmission—$215,244
Aircraft accessory, spare parts—5 items—$162,161
CD-850-5 transmissions—900—$8,674,983

GENERAL MOTORS CORP., Cadillac Motor Car Div., Detroit, Mich.
Gage engineering agency functions for M42A1 and M56 vehicles—$177,936

GENERAL MOTORS CORP., Chevrolet Motor Div., Detroit, Mich.
Trucks—565—$1,067,787
Automobiles—407—$556,836
Automobile, 5 pass.—4820—$5,775,325
Trucks, ¼ ton, 4x2 with panel, cargo, carry-all and maintenance bodies—various—$58,695
Truck, cargo, ½ ton, 4x2—1003—$1,080,-923

GENERAL MOTORS CORP., Foreign District Div., New York, N. Y.
Trucks—64—$111,448
Automobiles—13—$16,815

GENERAL MOTORS CORP., New Departure Div., Bristol, Conn.
Bearing, ball, various sizes—14,060—$27,077
Bearings—296,182—$67,014

GENERAL MOTORS CORP., Pontiac Motor Div., Pontiac, Mich.
Guns, auto, 20MM M139A1—$3,582,464

GENERAL MOTORS CORP., Truck & Coach Div., Pontiac, Mich.
Trucks—10—$51,902
Transmission and repair parts—various—$491,238
Truck, chassis, 2½ ton, 4x2—11—$30,743
Truck, stake & platform, 21000 GVW, 2½ ton, 4x2—163—$453,584
Replenishment parts—various—$68,257
Automotive spare parts—7772—$113,005

GENERAL TIRE & RUBBER CO., Akron, Ohio
Tire, 12.00x20—2250—$173,655

GILFILLAN BROS., INC., Los Angeles, Calif.
Aircraft accessory spare parts—6 items—$280,632

GOULD-NATIONAL BATTERIES, INC., Depew, N. Y.
Storage batteries—$51,675

(*Turn to page* 184, *please*)

Classified Advertisement

FUEL TANK REPRESENTATIVES WANTED. LEADING MANUFACTURER OF COMPLETE LINE OF UNDERWRITERS APPROVED FUEL TANKS REQUIRES REPRESENTATIVES TO COVER MAJOR MOTOR TRUCK, FARM EQUIPMENT AND TRACTOR MANUFACTURERS. RARE OPPORTUNITY FOR AN AGGRESSIVE SALESMAN OR SALES COMPANY. ALL REPLIES IN STRICTEST CONFIDENCE. BOX 17, AUTOMOTIVE INDUSTRIES, 5601 CHESTNUT STREET, PHILADELPHIA 39, PA.

SURE AID TO NEW PRODUCTION RECORDS!



These fast-moving days of new ideas, bigger orders, and harder competition call for "new talent" on your assembly line. A new fastener and its more exacting application to your special need may provide the specific "talent" you need.

That fastener is probably waiting for you . . . in the great variety of Southern Quality screws and bolts on hand for prompt shipment to you—from factory or from a Southern warehouse near you.

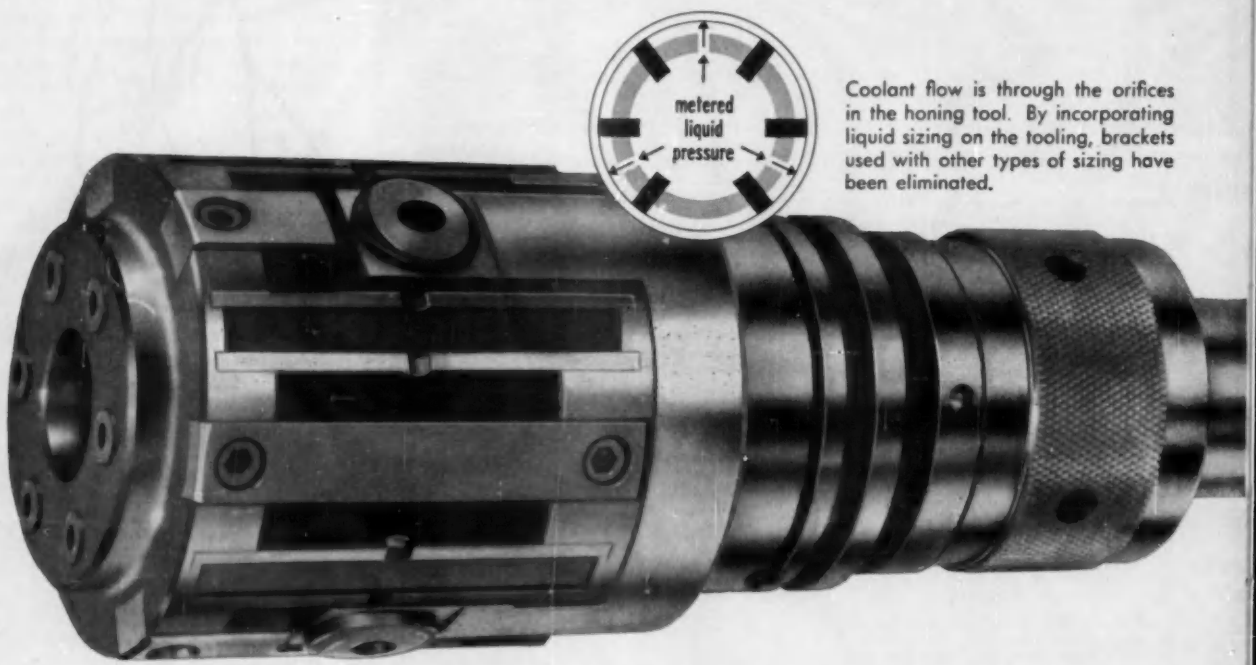
Pass your problem on to us. Samples and Stock List free upon request. Write Southern Screw Company, Box 1360-AI, Statesville, N. C.

Wood Screws • Stove Bolts • Machine Screws & Nuts • A&B Tapping Screws • Roll Thread Carriage Bolts • Hanger Bolts • Dowel Screws • Wood & Type U Drive Screws

Southern SCREW COMPANY
STATESVILLE • NORTH CAROLINA

Warehouses:
New York • Chicago • Dallas
Los Angeles

new liquid sizing



Coolant flow is through the orifices in the honing tool. By incorporating liquid sizing on the tooling, brackets used with other types of sizing have been eliminated.

CUSTOM-HONING SERVICE for special short-run applications. Send us your short-run pieces, with specifications and requirements for prompt honing by expert technicians.

automatically gauges full length of honed bores

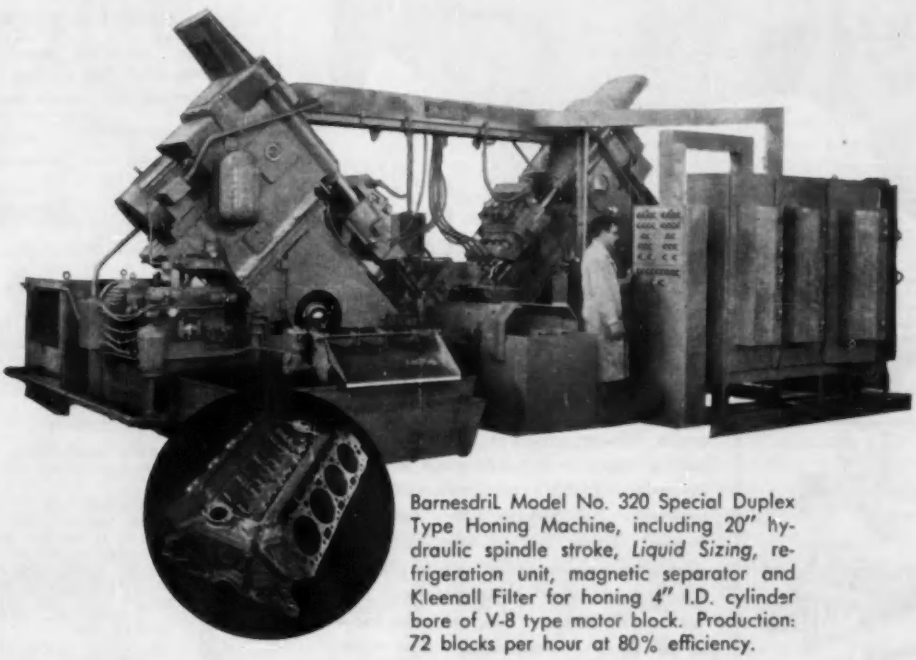
Barnesdril honing engineers have developed an improved method for sizing honed bores, as a part of the honing machine cycle. Referred to as Liquid Sizing, this method automatically gauges the diameter of honed bores throughout their full length as honing progresses.

Sizing is accomplished by metering liquid pressure, directed against the cylinder wall through orifices in the honing tool. As honing progresses, the bore increases in size, causing the pressure to decrease. When the pre-selected bore size is indicated over full length of honed bore by the balanced pressure, a limit switch terminates the honing machine cycle, permitting the tool to complete the stroke and withdraw from the bore.

This new Barnesdril Liquid Sizing method offers the following advantages:

1. Sizing the entire length of bore.
2. Better heat control as a result of directing the flow of coolant through the honing tool orifices to the most critical point.
3. Continual stone flushing, giving longer stone life and better micro finish control.
4. New Barnesdril Plate Type Honing Tools are utilized.

Contact your Barnesdril representative for full details on new Liquid Sizing, or write us directly. Years of engineering experience dealing with honing problems enable Barnesdril engineers to supply the most practical methods and equipment to solve your hole finishing problems.



Barnesdril Model No. 320 Special Duplex Type Honing Machine, including 20" hydraulic spindle stroke, *Liquid Sizing*, refrigeration unit, magnetic separator and Kleenall Filter for honing 4" I.D. cylinder bore of V-8 type motor block. Production: 72 blocks per hour at 80% efficiency.

50th year

BARNES DRILL CO.

850 CHESTNUT STREET • ROCKFORD, ILLINOIS
DETROIT OFFICE: 3419 South Telegraph Road

More Government Contract Awards

(*Continued from page 181*)

GOULD-NATIONAL BATTERIES, INC., St. Paul, Minn.
Battery, dry charged, 12 v.—48,000—$557,280

HERCULES MOTORS CORP., Canton, Ohio
Repair parts, pump kit, pump, gasket, plug—582 items—$106,742

HOLLEY CARBURETOR CO., Van Dyke, Mich.
Overhaul & repair of fuel controls, spare parts—various—$190,389
Automotive spare parts—3290—$96,148
Aircraft accessory spare parts—39 items—$96,262

HYSTER CO., Portland, Ore.
Crane, tractor mounting, revolving—6—$54,960

INTERNATIONAL GENERAL ELECTRIC CO., New York, N. Y.
Truck mounted drilling rig—1 lot—$151,227

INTERNATIONAL HARVESTER CO., Washington, D. C.
Trucks—38—$145,585

INTERNATIONAL HARVESTER EXPORT CO., Chicago, Ill.
Trucks—6—$11,691

JOY MFG. CO., Washington, D. C.
Air compressor, gasoline driven—12—$64,560

LAHER SPRING & TIRE CORP., Oakland, Calif.
Automotive storage batteries — indef. qty.—$128,000

LOCKHEED AIRCRAFT CORP., Burbank, Calif.
One static test article representative of F-104B aircraft—$390,651
Design development study for F104A airplane—$164,449

LOCKHEED AIRCRAFT CORP., Marietta, Ga.
Phase I, C-130A, flight testing—$276,299

LOCKHEED AIRCRAFT SERVICE, INC., Ontario, Calif.
Iran and modification of RC-121 C/D type aircraft—55—$789,287

McDONNEL AIRCRAFT CORP., St. Louis, Mo.
Modification of F101A aircraft—23—$100,037
Modernization program for F3H type aircraft—$7,918,460

GLENN L. MARTIN CO., Baltimore, Md.
Engineering, prototype installation, spare parts, tooling, testing applicable to B-57 aircraft—$1,195,310

METRO ENGINEERING & MFG. CO., INC., Detroit, Mich.
Body, van for truck, van expansible 2½ ton, 6x6 XM292—132—$1,491,692

MOTOR WHEEL CORP., Lansing, Mich.
Brake, drum, automotive—9298—$29,586

OSHKOSH MOTOR TRUCK, INC., Oshkosh, Wis.
Trucks—1—$17,953

PACIFIC CAR & FOUNDRY CO., Renton, Wash.
Modification and conversion of M52 (T97) and M55 (T108) combat vehicles—80—$335,987

PIERCE GOVERNOR CO., INC., Anderson, Ind.
Aircraft accessory spare parts — 66 items—$91,053

RAYMOND CORP., Washington, D. C.
Truck, fork lift, electric, 3000 lb. cap.—54—$300,240

REO MOTORS INC., Washington, D. C.
Trucks—9—$51,063

REO MOTORS, INC., Lansing, Mich.
Automotive spare parts—627—$33,908

RYAN AERONAUTICAL CO., San Diego, Calif.
Incorporate miscellaneous CCN's for Q-2A Targets—$550,264

SIKORSKY AIRCRAFT, UNITED AIRCRAFT CORP., Stratford, Conn.
Helicopters (H-19D)—$2,717,000

HENRY SPEN & CO., INC., Brooklyn, N. Y.
Liquid oxygen trailers—174—$352,133

SUNDSTRAND MACHINE TOOL CO., Sundstrand Aviation Div., Rockford, Ill.
Transmission assys. gear boxes, shaft, connecting, cover, connecting shaft, valve boost pump for support of F-100D aircraft—$1,950,952
Transmission & governor assemblies for KC-135 aircraft—$4,235,280

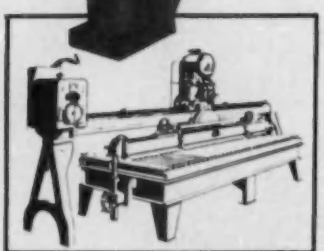
THIOKOL CHEMICAL CORP., Elkton Div., Elkton, Md.
XM-16 E1 rocket engines for Matador missile—$790,758

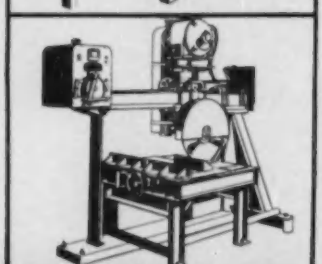
UNITED AIRCRAFT CORP., Hamilton Standard Division, Windsor Locks, Conn.
Air turbine starter HSD Model 300—81—$973,840
Propellers—$2,961,675
(*Turn to page 186, please*)

HIGH-SPEED SAW WITH CLAMP TABLE MAKES IRREGULAR SHAPE CUTS



WRITE FOR FREE CATALOG



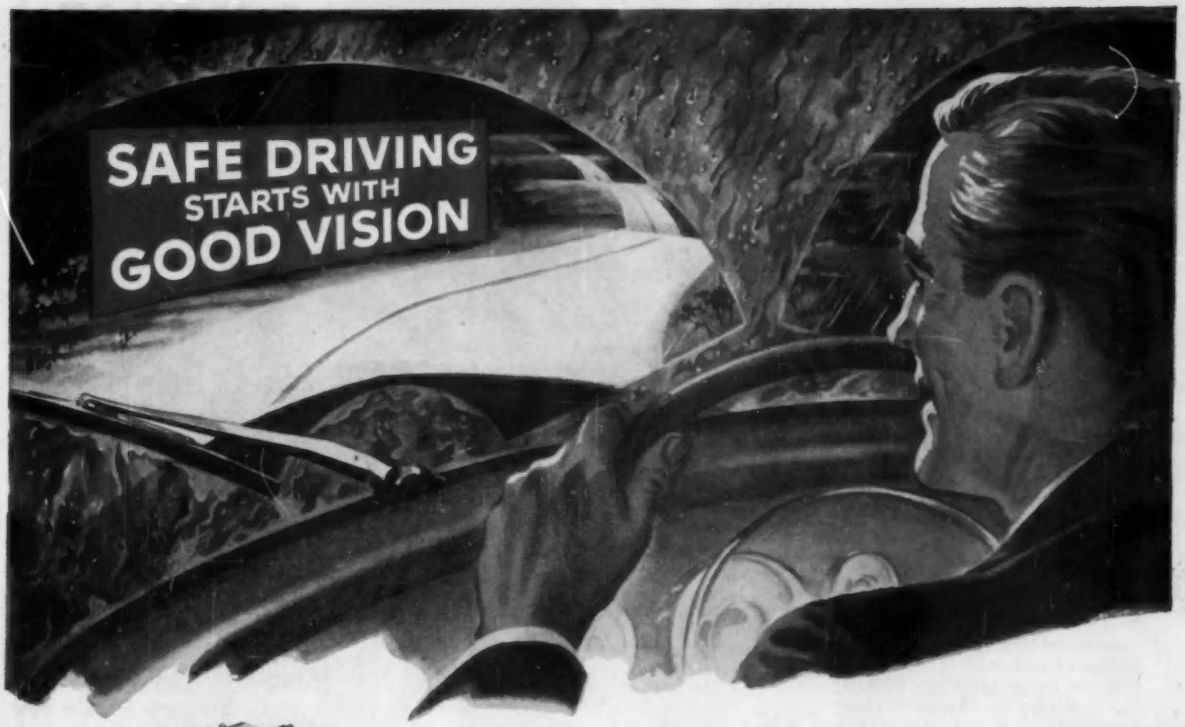


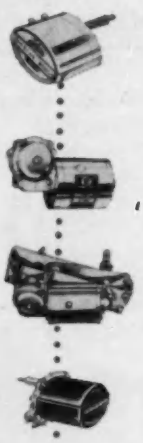
LOW INVESTMENT SAW CUTS METAL FAST & CLEAN

Whether you're making straight cuts, odd angle cuts or irregular shapes such as turbine impeller blades, you'll find the Ty-Sa-Man 144 BD combination of speed and amazing accuracy will save you money. Table has positive air-driven clamps to hold material in any position. Other Ty-Sa-Man cut-off models from 10" to 58" cuts . . . long-cut saws for 4' to 60' cuts, with or without cross movement, for friction or abrasive sawing.

Ty-Sa-Man MACHINE COMPANY

1006 WHITE AVE., KNOXVILLE, TENN.





DUAL & SINGLE TYPES
For Automotive and Marine Applications for 6-12-24 v. Systems



Design for Safety with
AMERICAN BOSCH
Constant ELECTRIC *Action*
WINDSHIELD WIPERS

Car and Truck drivers travel more accident-free miles, even in the toughest weather, when they have constantly clear vision with American Bosch *Electric* Windshield Wipers. Regardless of speed or load, on up-grades and during acceleration, American Bosch *Constant Electric Action* is steady and dependable. Independent of engine vacuum, it eliminates stuttering, stalling blades—helps keep drivers in the clear and out of trouble on the road.

American Bosch *Electric* Wipers are in wide use as original equipment. There are Dual and Single types, models for large size arms and blades—dependable Windshield Wipers with heavy duty construction that guarantees years of trouble-free service.

These famous *Electric* Windshield Wipers are today's positive answer to good vision in bad weather, and they offer a keen, sales-active feature for your vehicles. Ask for complete specifications. American Bosch, Springfield 7, Mass. A Division of American Bosch Arma Corporation.

AMERICAN BOSCH



CHILE	COLOMBIA	PERU	ARGENTINA
SPAIN	PORTUGAL	SO. AFRICA	SWEDEN
ISRAEL	JAPAN	BELGIUM	MEXICO
INDIA	AUSTRIA	BRAZIL	CANADA
ITALY	GERMANY	URUGUAY	ENGLAND
DENMARK	FINLAND	FRANCE	U. S. A.

24 NATIONS UNITED...

on Choice of Yoder Mills for Pipe and Tube Manufacture

It all started less than two decades ago with the introduction by Yoder—and the rapid adoption by American industry—of a revolutionary new type of mills for cold forming and electric-resistance welding of pipe and tubing. England, France, Italy, Mexico, Argentina, and Brazil soon followed the U.S.A. in adopting these mills. Other countries boasting any kind of modern metal working industry did likewise, even including distant Japan, India and South Africa. Production, depending on requirements, varies from 25,000 up to 75,000 feet per 8-hour shift.

●

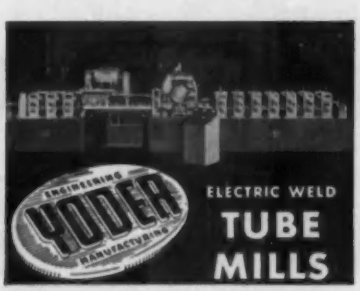
By this time, England, Italy and Argentina each have a total of ten Yoder mills in operation; Brazil, eight; Mexico, six; France, five; other nations somewhat in proportion to their population. In many nations, Yoder mills now supply from 50% to 90% of all welded tubes used. Several outstanding production records have been scored by operators in foreign countries, most recently in Italy. Reasons: the simplicity of design, ease of operation and dependability of Yoder mills. Secondly, generous assistance rendered by Yoder in training operators everywhere.

●

Through technological advances, Yoder leadership in tube mill design has been jealously maintained and strengthened from year to year. Ask for literature giving details of the latest improvements. Correspondence invited.

THE YODER COMPANY

5553 Walworth Ave. • Cleveland 2, Ohio, U.S.A.



(*Continued from page* 184)

UNITED MANUFACTURING & ENGINEERING CORP., Independence, Mo.
Trailer, oil servicing, 600 gal. cap. aluminum tank—1—$156,600

UNITED STATES RUBBER CO., Mishawaka, Ind.
Kit cell assy.—1200 gal. capacity for installation in bomb bay B-45 aircraft —100—$219,500

UNITED STATES RUBBER CO., Fisk Tires Div., Detroit, Mich.
Tire, 9.00x20—3322—$123,678

UNIVERSAL BATTERY CO., Chicago, Ill.
Automotive storage batteries — indef. qty.—$186,000

VICKERS, INC., Detroit, Mich.
Parts on pumps for various aircraft—various—$75,480
Assys. & parts for various a/c—$35,412
Valve parts for various a/c—$75,437

WALKER MFG. CO. OF WISCONSIN, Racine, Wis.
Muffler, exhaust w/bracket assy.—7740 —$65,093

WATSON AUTOMOTIVE EQUIPMENT CO., Washington, D. C.
Trucks—2—$10,312

WAUKESHA MOTOR CO., Waukesha, Wis.
Repair parts, pump, sleeve, piston—287 items—$53,091

WAYNE MANUFACTURING CO., Pomona, Calif.
Sweeper, rotary, street type, self-propelled, 3 wheel mtd.—31—$199,412

WESTRIC BATTERY CO., Denver, Colo.
Automotive storage batteries — indef. qty.—$158,000

WESTINGHOUSE ELECTRIC CORP., Washington, D. C.
Instructions in the maintenance, repair and operation of J34 and J46 jet engines—$344,688

WILLYS MOTORS INC., Toledo, Ohio
Trucks—137—$283,898
Jeeps—8—$18,600
Automotive spare parts for ¼ ton, 4x4 vehicles—$610,041
Engines for various vehicles—$53,830

BOOKS...

PLASTIC TOOLING BIBLIOGRAPHY, *published by American Society of Tool Engineers Research Fund, 10700 Puritan Ave., Detroit 38, Mich. Price, 75 cents to members; non-members, $1.50.* This 46-page bibliography is the most complete one compiled in this field to date. It was prepared by Orville D. Lascoe, Professor of Industrial Engineering at Purdue University, as part of a plastic tooling research project sponsored by the ASTE Research Fund. The volume contains 254 references as well as abstracts of every major piece of writing on plastic tooling since its inception.

1957 U. S. EXCISE TAX GUIDE, *published by Commerce Clearing House, Inc., 4025 W. Peterson Ave., Chicago 30, Ill. Price, $3.00.* This 464-page volume is designed to answer any questions on the subject of federal excise taxes. It is based throughout on the 1954 Internal Revenue Code (with latest amendments), the latest Treasury regulations, and court and Tax Court decisions. Supplementing the detailed explanations comprising the main body of the text are such features as: tables of excise rates; lists of excise tax forms by subject matter and numbers; a Code section finding list; and check lists of taxable and nontaxable items.

FLEXIBILITY

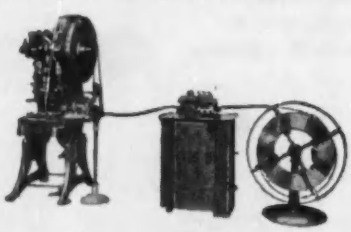
in Stock Straightening



WITTEK

STOCK STRAIGHTENERS

Used in conjunction with a reel stand and automatic feed for punch presses, the Wittek Stock Straightener is a self-contained, motor-driven unit designed for maximum efficiency in the continuous straightening of coiled stock. Standard models handle stock with widths up to 12 inches. An infinitely variable speed drive permits any desired straightening speed so that the proper slack is maintained in the straightened strip between the unit and the press feed.



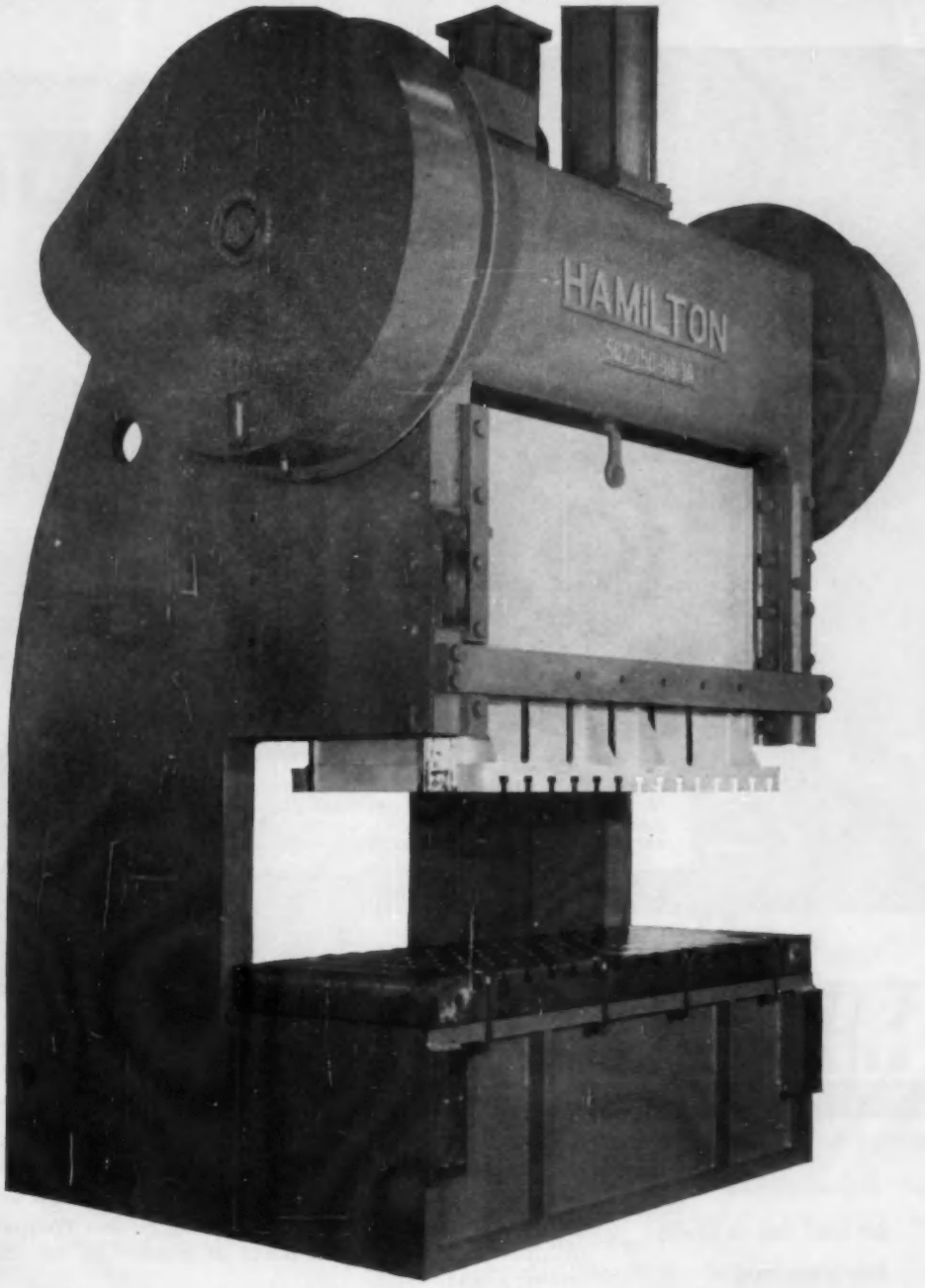
This typical Wittek automatic production feeding setup includes—Wittek roll feed mounted on the punch press, Wittek stock straightener, and Wittek self-centering reel stand.

Write for full particulars

WITTEK Manufacturing Co.

Production Feeding Equipment

4319 W. 24th Place • Chicago 23, Illinois



Hamilton press line expanded to include medium size presses

Pictured above is a new Hamilton Gap Press recently installed at the Eaton Manufacturing Company, Cleveland, Ohio. This new large-bed press stamps out the larger grille guards which the latest model cars are calling for.

The capacity of this press is 250 tons and the speed 28 to 30 strokes per minute. Bed area is 90 in. right to left; 36 in. front to back. It is one of a new line of single and double-crank presses ranging from 100-300 tons capacity.

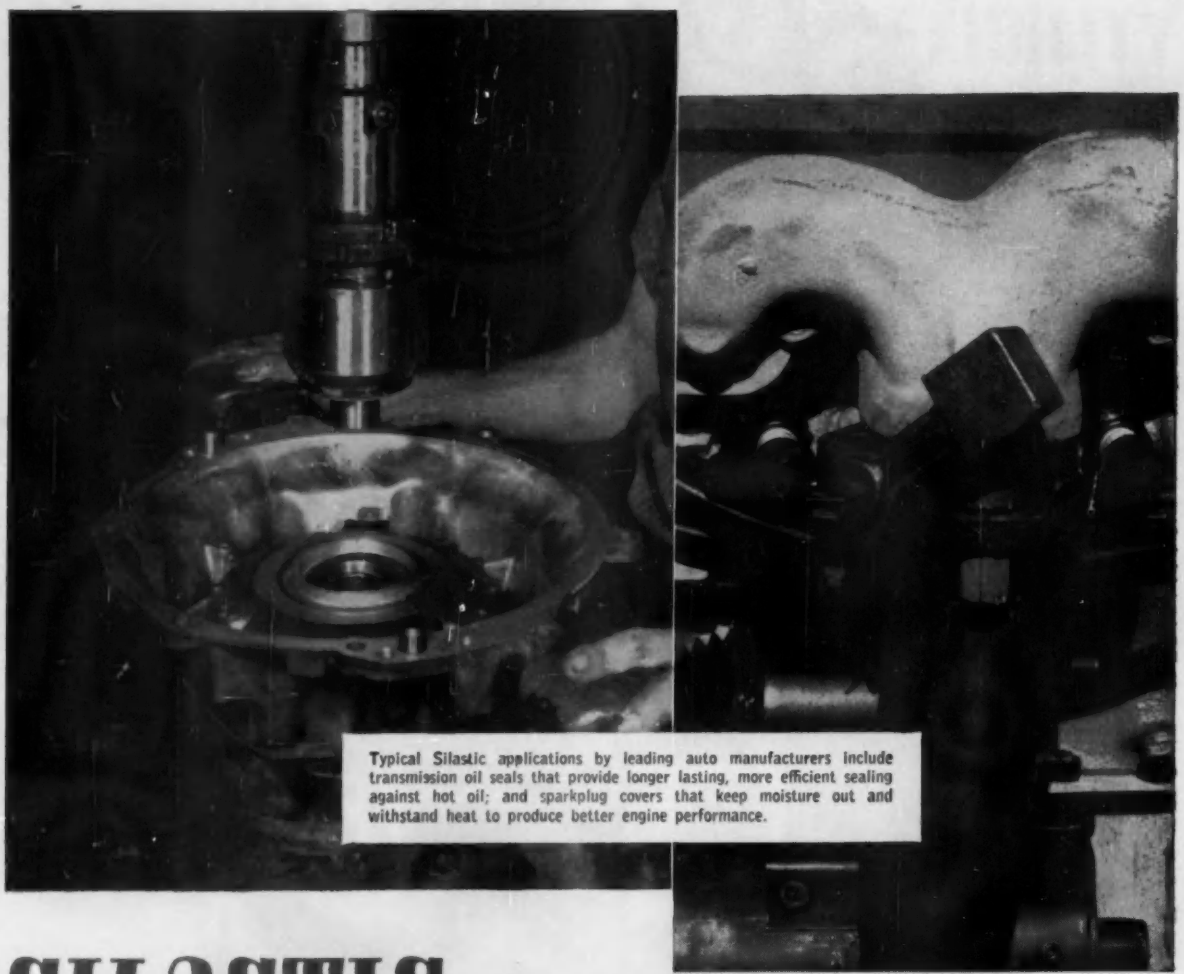
Write to Hamilton Division, B-L-H Corporation, for full information and specifications on this new line of heavy duty Hamilton presses.

Hamilton Division Hamilton, Ohio

BALDWIN · LIMA · HAMILTON

Diesel engines • Mechanical and hydraulic presses • Can making machinery • Machine tools

BALDWIN BLH LIMA-HAMILTON



Typical Silastic applications by leading auto manufacturers include transmission oil seals that provide longer lasting, more efficient sealing against hot oil; and sparkplug covers that keep moisture out and withstand heat to produce better engine performance.

SILASTIC molded parts seal oil in, moisture out

SILICONE RUBBER

Molded parts of Silastic*, Dow Corning's silicone rubber, show little or no change in physical or dielectric properties after long exposure to temperature extremes which would quickly ruin organic rubber. Leading rubber companies fabricate Silastic molded parts in practically any color, size or shape.

Get latest data on Silastic

Mail coupon today

Dow Corning Corporation, Dept. 0618
Midland, Michigan
Please send me latest data on Silastic

NAME _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

*T.M.REG. U.S.PAT. OFF.

Typical Properties of Silastic for Molded Parts

• Temperature Range, °F	—130 to 500
• Tensile strength, psi	600 to 900
• Elongation, %	150 to 300
• Compression set, %, @ 300 F	15 to 40
• Hardness range, durometer	20 to 90
• Dielectric strength, volts/mil	400 to 500
• Oil resistance	Dependent on type of oil

If you consider ALL the properties of a silicone rubber, you'll specify SILASTIC.

first in silicones — DOW CORNING SILICONES

DOW CORNING CORPORATION • MIDLAND, MICHIGAN



Formsprag Full-Complement Over-running Clutches eliminate artificial spacing and built-in drag

In automotive, aircraft, truck and farm implement power transmission applications — designers are exceedingly aware of the need for increased torque capacity in less space.

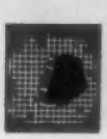
Formsprag Clutches provide a positive solution. The backbone of these over-running clutches is the exclusive, highly-developed sprag. Due to their construction, a full-complement of sprags can be fitted into a given space . . . *and they space automatically.* The result: Greater engine torque capacity is transmitted and the unit is compact.

In addition, no built-in drag is required. The consequent wear is eliminated and you are guaranteed of much longer clutch life.

As the pioneer in the manufacture of sprag clutches, Formsprag offers the finest in precision manufacture and design facilities. Simple, basic design makes them ideal for economical prototypes for testing. *Complete* clutches are a specialty.

"Need Compact Torque Capacity?" Call on Formsprag—World's largest exclusive manufacturer of over-running clutches.

FORMSPRAG COMPANY



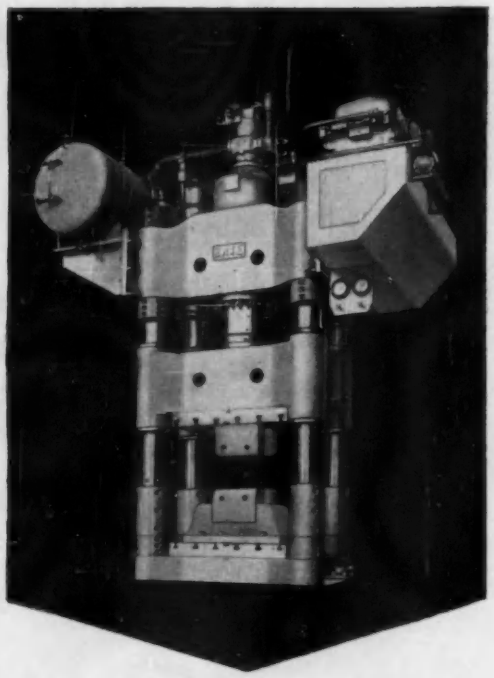
23583 HOOVER ROAD, VAN DYKE (DETROIT), MICHIGAN

THE ONLY CLUTCH THAT CAN GIVE YOU FULL-COMPLEMENT PERFORMANCE

A-12-6C

PRESS or HAMMER?

..which is best for your forged product?



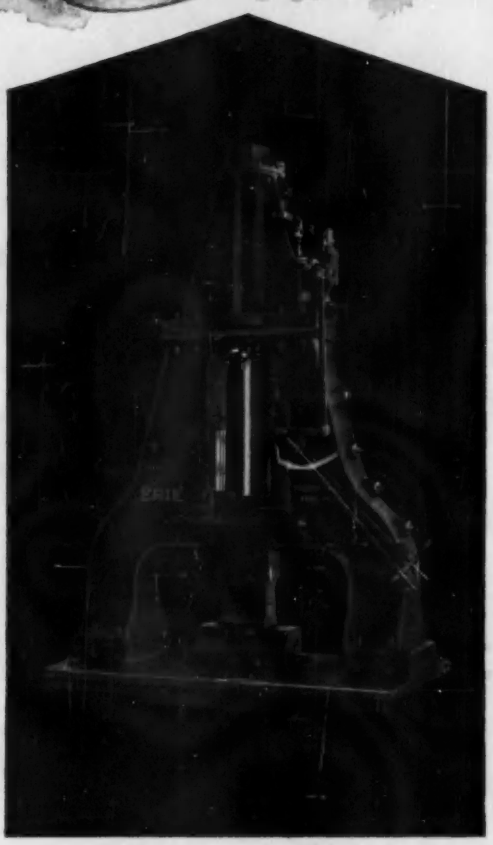


When it comes to open die forgings, there are as many different opinions on what equipment is best as there are open die forge shops and open die forgings.

But, before adding any new equipment, the wise forge shop operator talks with Erie Foundry Company . . . the firm that makes the best in *both* hammers and presses!

Erie's all-steel open die hammers, single frame and double frame, have justly earned their reputation as the industry's most rugged hammers. And now the newer, fast-acting Erie flat die forging presses are proving to be the ideal equipment for meeting the most exacting requirements for any hydraulic press.

So . . . which is best for you—hammer or press? For expert and *specific* advice, talk to the recognized leader . . . Erie Foundry Company. Just call or write.



ERIE FOUNDRY CO. ERIE 5, PA.

ERIE

World's Greatest Name in Forging Machines Since 1895

COMPACT . . . POWER-PACKED TRI 55 CLAD MOTORS

Plan now to use G-E TRI 55 CLAD motors in ratings to 125-hp

REG. U.S. PAT. OFF.

Increased production throughout U.S. industry has created a demand for more powerful machines with greater speeds and increased capacity. To meet this demand, General Electric will soon announce a wider range of Tri-Clad '55' motors in compact . . . power-packed dimensions.

ADVANCE INFORMATION—Experienced engineers and skilled craftsmen have utilized revolutionary new materials and the most modern production techniques to pack more power into these larger G-E motors built to new NEMA standards. The more rugged, higher horsepower motors will feature easy installation, reduced maintenance, and long-life performance.

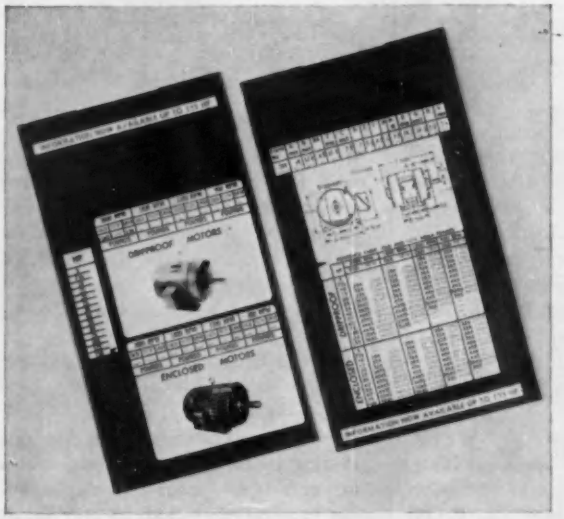
PLAN AHEAD—New Tri-Clad '55' motors can mean real savings in your plant modernization project and in new product design. For complete details on the wider range of motors, contact your nearest General Electric Apparatus Sales Office. For advance size information, send in the attached coupon for free slide rule. General Electric Company, Schenectady 5, New York.

Progress Is Our Most Important Product

GENERAL ELECTRIC

FREE SLIDE RULE

ADVANCE INFORMATION TO HELP YOU PLAN AHEAD



FREE SLIDE RULE—Write for free slide rule which lets you determine at a glance the weight and space-saving benefits of new Tri-Clad '55' motors up to 125-hp. This handy slide rule provides advance information to solve your design problems . . . to benefit your over-all operation.

SECTION E891-2

GENERAL ELECTRIC COMPANY

SCHENECTADY 5, NEW YORK

I would like advance information on new dimensions of Tri-Clad '55' motors up to 125-hp. Please send me free slide rule.

NAME_____

TITLE_____

COMPANY_____

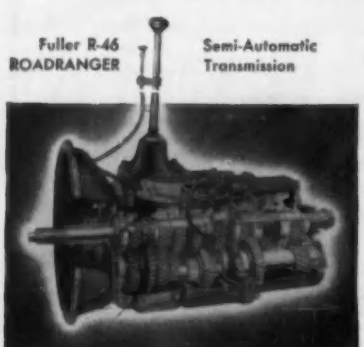
ADDRESS_____

CITY & STATE_____



One of Yule's new C.O.E. International Tractors with Fuller 8-speed ROADRANGER Transmission

YULE eliminates transmission problems with FULLER 8-speed ROADRANGERS®



FULLER MANUFACTURING CO. Transmission Division • Kalamazoo, Mich. Unit Drop Forge Div., Milwaukee 1, Wis. • Shuler Axle Co., Louisville, Ky. (Subsidiary) • Sales & Service, All Products, West. Dist. Branch, Oakland 6, Cal. and Southwest. Dist. Office, Tulsa 3, Okla.

Says V. A. Martell, President of Yule Truck Lines, Inc., Milwaukee, Wisconsin: "Fuller ROADRANGERS have eliminated all our transmission problems. We get the kind of gearing we need to take us through any kind of traffic and road condition. After continuous testing under every conceivable condition, the Fuller 8-speed semi-automatic ROADRANGER Transmission thoroughly proved itself. Our drivers say: 'This is it!' and they wouldn't have anything else."

"And," adds E. A. Jenkins, General Manager—Operations: "We will have ROADRANGERS in our future units for sure. For our operation, ROADRANGER Transmissions, C.O.E. tractors and big engines are the answer. Our maintenance superintendent credits the Fuller ROADRANGER Transmission with increased efficiency and with decreased maintenance cost."

Yule's latest fleet additions include 10 International CO-205 Tractors with RD-450 Engines, and 5 International R-195 Tractors with RD-406 Engines . . . all equipped with Fuller 8-speed semi-automatic ROADRANGER Transmissions.

The same outstanding ROADRANGER Transmission advantages . . . low maintenance costs—easier, quicker shifts—higher average road speeds—greater fuel economy—38% steps between ratios keep engines operating in the high rpm range—less driver fatigue—space-and-weight saving economies . . . can be applied to *your* operation.

For complete details on Fuller ROADRANGERS, see your truck manufacturer or truck dealer now!



ORIGINAL EQUIPMENT MANUFACTURERS who have done business with BCA have told us they find our approach to their ball bearings problems unusually helpful. Our long and specialized bearing experience plus our manufacturing flexibility can work to your advantage in terms of improved product performance and production economies. Bearings Company of America Division, Federal-Mogul-Bower Bearings, Inc., Lancaster, Pa.

FREE! BCA "Engineering Handbook." Available to engineers without cost. Write on your company letterhead.

BCA
Division

Federal-Mogul-Bower Bearings, Inc.



Tru-Stop Brakes

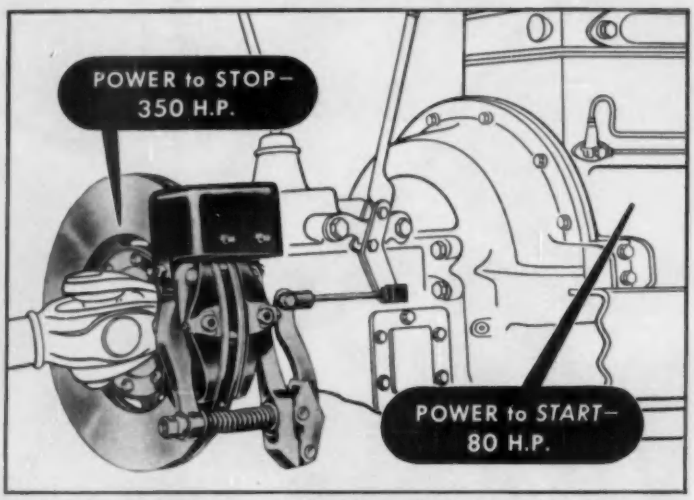
Meet Every Heavy-Duty Safety Requirement

OFFER POSITIVE PROTECTION AGAINST RUNAWAY OR PARKING ACCIDENTS—AT LOWEST COST

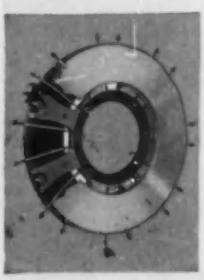
HERE IS WHY:

They have surplus power required for emergency service—no dangerous self-energizing

TRU-STOP Heavy-Duty Emergency Brakes are not only excellent parking brakes. They serve as a complete, independent and fully reliable braking system. Operating on the propeller shaft they enable the driver to continue on safely in the event of service brake failure. TRU-STOP brakes have the surplus braking capacity to be used *repeatedly* as an auxiliary to service brakes.



Brakes actually do more work than the engine in terms of horsepower Where it takes 80 HP to accelerate to 20 miles per hour, it takes 350 HP to make a safe stop from 20 miles per hour within required limits



Ventilated to throw off heat

Brake efficiency depends on ability to throw off intense heat —rapidly. Discs of TRU-STOP brakes are exposed to the air even during the braking operation. Ventilated design circulates air *between* the disc plates.



Give uniform brake pressure

Disc of TRU-STOP brakes is "squeezed" between the flat surface of the shoes. Effort applied to brake lever operates front and rear lever arms simultaneously. Pressure is exerted on the center of each shoe. Entire lining surface is in contact.

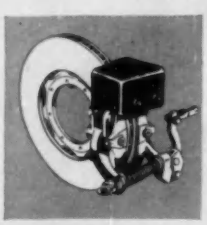
TRU-STOP HEAVY DUTY BRAKES OUTPERFORM AND OUTLAST DRUM-TYPE BRAKES

DON'T LET THE SURFACE AREA FOOL YOU!



Drum-type brake

43¼ square inches of lining. Lining covers 310 degrees of the drum. *BUT* only 50 degrees of the lining-covered drum is exposed to the air.

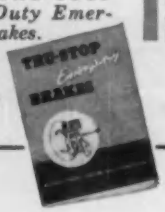


Tru-Stop brake

28 square inches of lining. 90 degrees of the disc under pressure. *BUT* 270 degrees of the disc is exposed to air. Directing and throwing off heat is basis of brake efficiency.

We will be glad to answer any questions or give you more detailed information about TRU-STOP Heavy Duty Emergency Brakes. Send for

Catalog DH 33



THE TEST

Drum-type Brake ___ **vs** ___ ***Tru-Stop Brake***

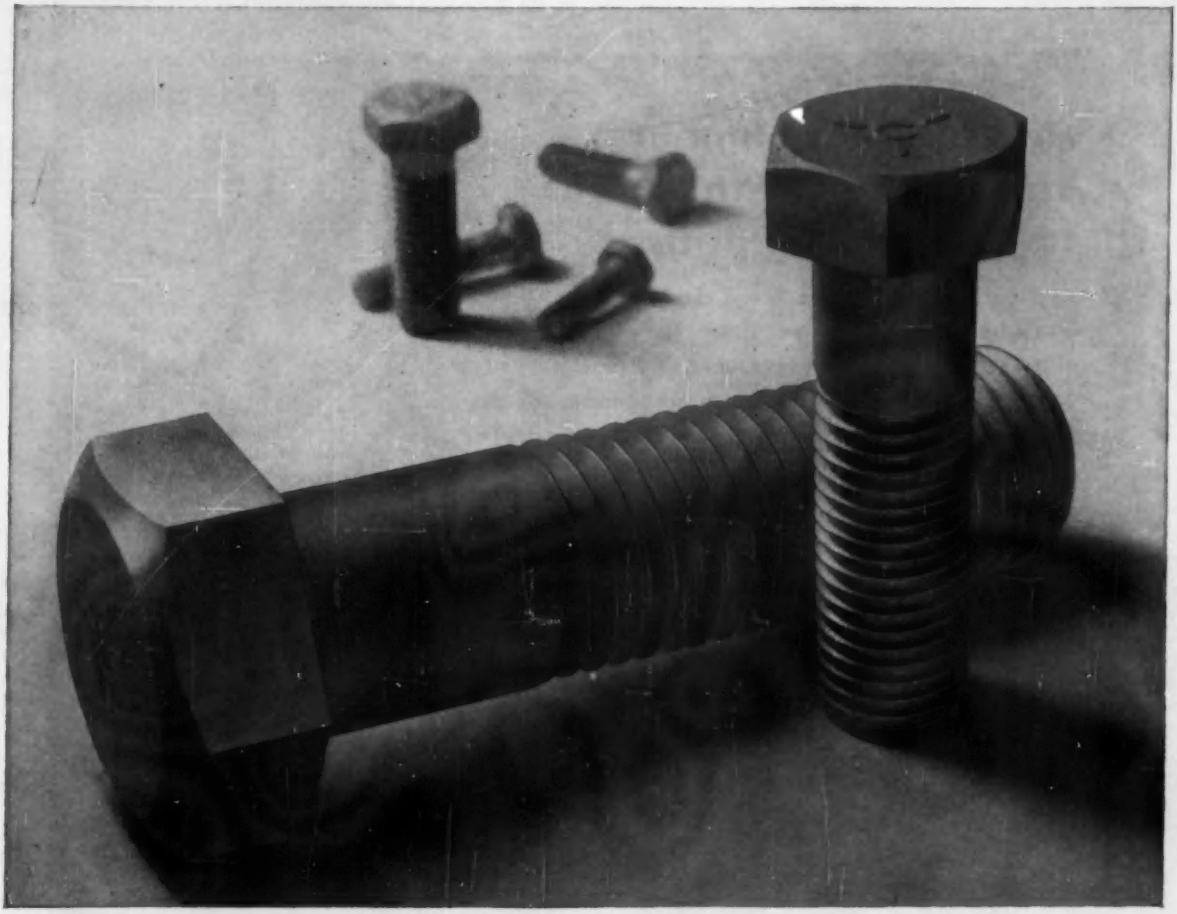
After a few light and two heavy applications from 20 MPH, lining was useless for further test.

Repeatedly stopped vehicle from 50 MPH —was then used to decelerate on steep grades. No serious damage to lining.

Automotive and Aircraft Division
AMERICAN CHAIN & CABLE

601 Stephenson Building, Detroit 2
2216 S. Garfield Street, Los Angeles 22 • Bridgeport 2, Conn.

ACCO



Cleveland upset forged hexagon head cap screws make your assemblies stronger and safer

Cleveland's upset forging process puts an extra measure of fastener muscle into your assemblies. The flow lines in every hexagon head cap screw follow the contour of the head, eliminating the planes of weakness along which shear might occur under the dynamic stress of heavy impact and vibration.

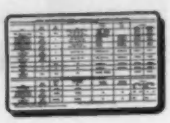
Cleveland hexagon head cap screws are manufactured from a wide variety of steels and in many different tensile strengths. In most cases, a Cleveland standard will serve as well as a special and will be much less expensive. Check the chart at the right for the one best suited to your needs. Then see your local Cleveland distributor. He stocks Cleveland hexagon head cap screws in sizes and physical properties to meet the most exacting demands of modern machinery design. All standard size cap screws in bright and quenched and tempered steels are available without delay—alloy steels on short notice. And remember, your distributor is backed by the most up-to-date production facilities and the largest factory stock of hexagon head cap screws in the world.

TENSILE STRENGTHS OF CLEVELAND HEXAGON HEAD CAP SCREWS

Product	Size, in.	Tensile Strength, psi
Bright	Up to 7/8 incl. 1/2 to 1 1/8 incl. Over 1 1/8 to 1 1/2 incl.	85,000—105,000 75,000—100,000 65,000 min.
Quenched & Tempered (SAE Grade 5)	Up to 3/4 incl. Over 3/4 to 1 incl. Over 1 to 1 1/2 incl.	120,000 min. 115,000 min. 105,000 min.
Quenched & Tempered (SAE Grade 6)	Up to 5/8 incl. Over 5/8 to 1/4 incl.	140,000 min. 133,000 min.
Alloy (SAE Grade 7)	Up to 1 1/2 incl.	130,000 min.
Alloy (SAE Grade 8)	Up to 1 1/2 incl.	150,000 min.
Bright	Over 1 1/2 to 2 1/2 incl.	55,000 min.
Quenched & Tempered	Over 1 1/2 to 2 1/2 incl.	90,000 min.
Alloy	Over 1 1/2 to 2 1/2 incl.	125,000 min.

Note: Higher physicals, through use of selected alloys, can be supplied on special order.

GET YOUR COPY NOW — Pocket-size card giving you physical properties of Cleveland hexagon and socket head cap screws and Cleveland Place bolts.



THE CLEVELAND CAP SCREW COMPANY
4444-10 Lee Road, Cleveland 28, Ohio
WAREHOUSES: Chicago • Philadelphia • New York • Los Angeles

How T&W Technique serves the off-the-highway truck industry better

At the right are two examples of the *special* results produced by *T & W Technique* to meet the particular needs of makers of off-the-highway trucks. T & W offers you a completely coordinated team of engineering and production facilities, to furnish forged or stamped parts or assemblies which usually cost you less at your point of assembly.

Write today for full information.

SALES OFFICES NEW YORK • PHILADELPHIA
CHICAGO • INDIANAPOLIS • DETROIT
HOUSTON • LOS ANGELES

Forgings and Deep Drawn Stampings



Stampings for heavy trucks successfully produced by the wide range of Transue press equipment. Assembly operations completed by T & W include the dump ring, gasket flange reinforcements, and baffles, riveted and welded in place.



Off-the-highway truck axle, weighing 400 lbs., forged from C-1050 steel, delivered to truck builder heat-treated and cleaned, ready for machining and final assembly.



FORGINGS AND DEEP DRAWN STAMPINGS

TRANSUE & WILLIAMS
Over 50 years of experience
ALLIANCE, OHIO—USA





All types of molded friction materials, including light- and heavy-duty brake linings and thick blocks, clutch facings and special products for industry.



Sintermet — sintered metallic friction materials for transmission and clutch applications in the automotive, aircraft and industrial fields.

American Brakeblok

OFFERS

BOTH KINDS OF FRICTION ENGINEERING

To meet new and higher performance requirements of brake and transmissions systems as dictated by steadily rising levels of power, speed and loading, American Brakeblok has developed a full line of advanced friction materials . . . both sintered metallic and molded.

Insuring prompt fulfillment of each friction need are the organization and facilities of American Brakeblok:

- *Research:* Continued development has provided proven friction materials capable of meeting your design needs.
- *Testing:* Comprehensive lab and road evaluations, compiled into detailed reports for your project, substantially shorten your own testing time.
- *Production:* Three modern plants are equipped to guarantee specified quality in each product and have a capacity to meet the needs of millions of vehicles and machines annually.
- *Service:* Highly trained application engineers work hand in hand with your project team . . . insuring "no lost motion" even if design changes alter your original requirements.

To realize the full advantage of the American Brakeblok capabilities, we suggest you check with us during the initial stages of your brake or transmission design. A call or letter will bring quick action.

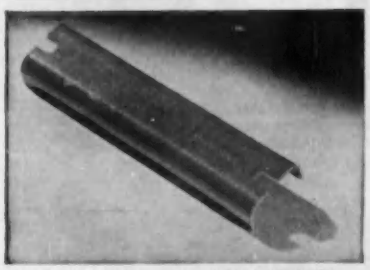
Brake Shoe

AMERICAN BRAKEBLOK DIVISION

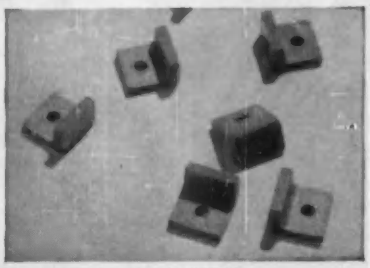
DETROIT 9, MICHIGAN



C-D-F MACHINES TO CLOSE TOLERANCES. Great accuracy is required to furnish ball bearing race retainers made from fine weave cotton fabric Dilecto rolled laminated plastic tubing. When plastics can do a better job than other materials, come to C-D-F for technical and production help.



C-D-F PIONEERED IN POST-FORMING of laminated plastics. This technique gives you stronger, more versatile insulating parts with lower costs. This aircraft channel strip is an example of simple post-forming.

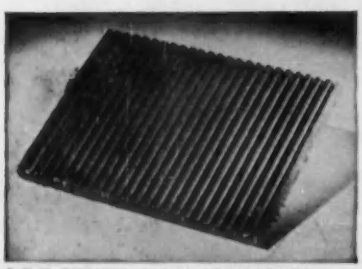


C-D-F DOES THE UNUSUAL. These rubbing blocks are made from fine-weave cotton cloth Dilecto molded *tubing* that has been pierced and cut. The part gains in mechanical strength — the product gets longer service life.

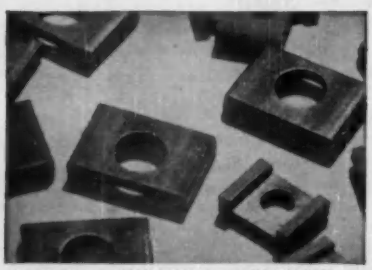


C-D-F SPECIALIZES IN AUTOMATIC SCREW MACHINING of plastic components. These breaker arm bushings are made from Dilecto paper base rolled tubing on high speed machines by men who know and use cost saving methods.

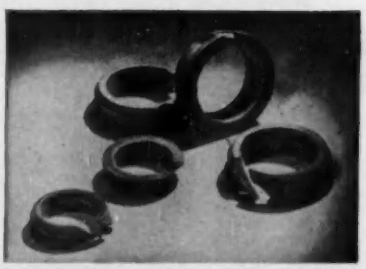
Yes, C-D-F is a big reliable source for fabricated plastics!



C-D-F SERVES MANY INDUSTRIES with fabricated specialties. A great amount is concentrated in the automotive and allied fields. This aircraft part has a corrugated surface on a strong woven asbestos laminated base.



C-D-F IS A PUNCHING SPECIALIST on these starter solenoid insulators. This is XX-26 Dilecto molded channel strip, pierced and punched to length. Special C-D-F punching grades give you lower costs, faster assembly, fewer rejects.



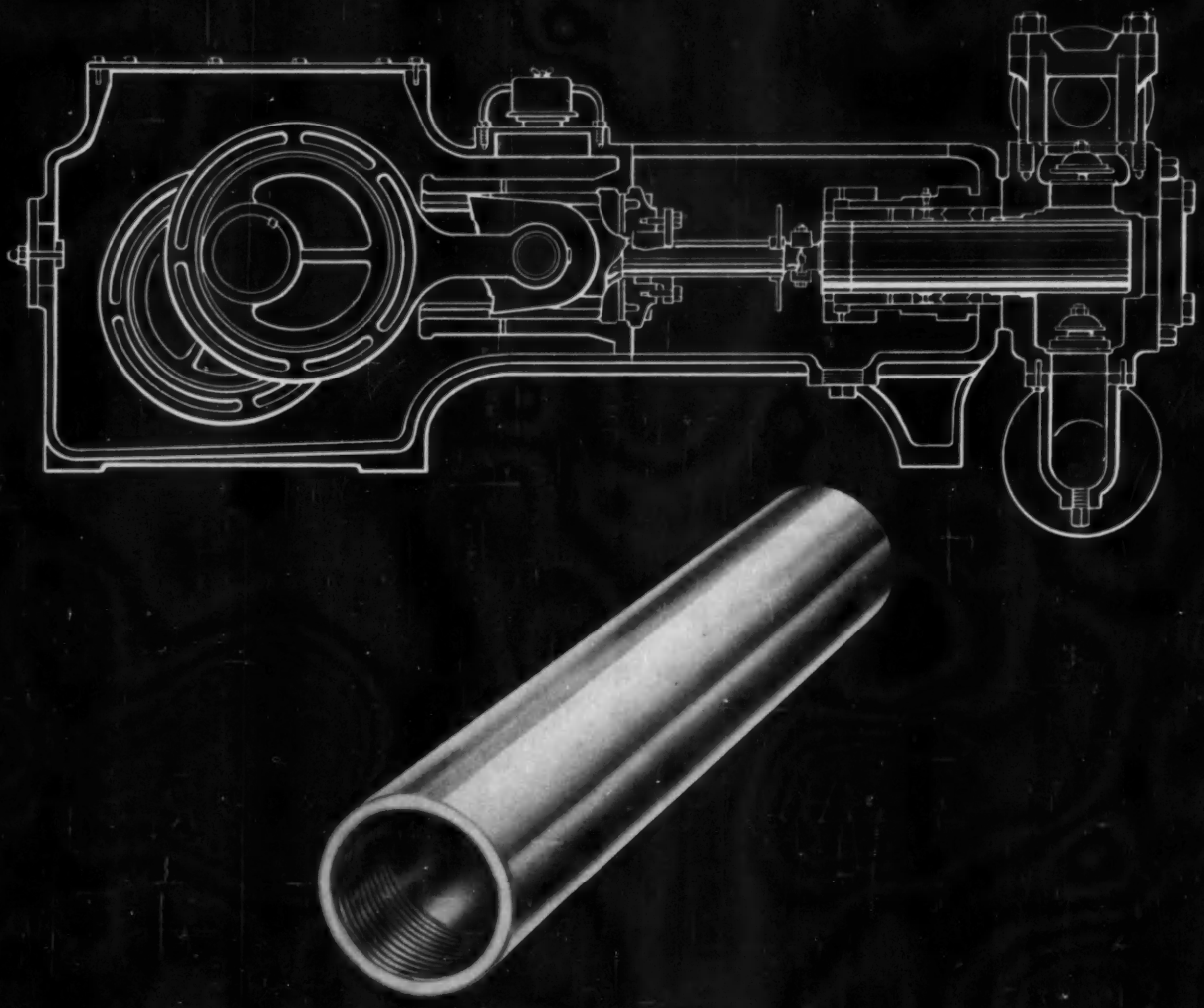
C-D-F COMES UP WITH THE ANSWERS to insulating problems. These unique snap-in grommets are easy to insert, spring out and hold tight. Write for samples. The chances are that C-D-F is already making the answer to your problem.

See our general catalog in Sweet's Design File for more technical data, the address and telephone number of your nearest C-D-F sales engineer. Also, write for detailed information, samples, or send us your print for quotation.

C D F

CONTINENTAL-DIAMOND FIBRE

A SUBSIDIARY OF THE Budd COMPANY • NEWARK 2, DEL.



Reducing Costs With Job Matched Tubing

Does a higher grade tube really cost more? Reduced overall manufacturing cost of pump plungers resulted when one maker switched from tubing made from open hearth processed alloy steel to B&W electric-furnace Alloy Steel Tubing. Rejections on a large production run were reduced drastically (10.75% to 1.25%).

The plunger had to have a very good finish and was to be chrome plated. Jobs like this require high quality and "clean" steel. Because of B&W's melting practices and familiarity with making "clean" steels for bearings and other applications, it was suggested to the fabricator that he consider B&W electric-furnace 8620 Steel Tubing. The use of B&W electric-furnace Alloy Steel drastically reduced rejects on the finished part.

Once again Mr. Tubes proved conclusively that final cost—not initial cost—is the measure of good tube fabricating practice. If you're concerned with costs as well as producing a good finished product, get in touch with Mr. Tubes. He can help you save money. The Babcock & Wilcox Company, Tubular Products Division, Beaver Falls, Pa.



TA-6100-M5

Seamless and welded tubular products, seamless welding fittings and forged steel flanges—in carbon, alloy and stainless steels.

Stronger! Lighter!

ALWAYS SPECIFY GUNITE CAST-STEEL WHEELS



FOR NEW EQUIPMENT

FOR CHANGEOVERS



Many leading fleet engineers specify Gunite Cast-Steel Wheels on all their heavy trucks and trailers . . . for good reason too! Gunite wheels are rugged . . . yet lightweight. Minimum unsprung weight increases payload . . . increases income. Compare weight with other wheels. Save with Gunite! Gunite wheels fit both tubeless and conventional tires.

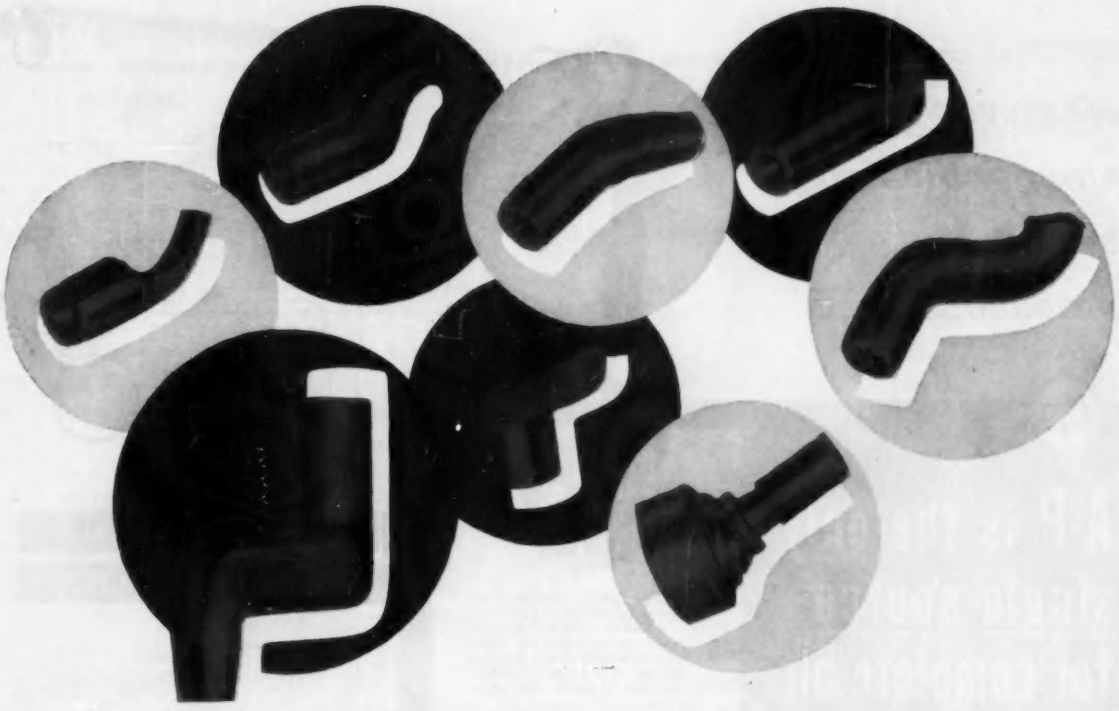
Call Your Gunite Distributor or Write for Complete Information



GUNITE BRAKE DRUMS for Trucks, Trailers and Buses

Gunite Drums offer you more miles of safe, sure stops. Ribbed design minimizes flexing, dissipates heat faster and resists checking. Write for information or see your Gunite Distributor.

GUNITE FOUNDRIES CORPORATION *Established 1854* **ROCKFORD, ILLINOIS**



9 times out of 10...

Standard Mallory Tips Fit Your Special Resistance Welding Jobs

Before you order a "special" welding electrode, ask your Mallory welding distributor to check your requirements against hundreds of *standard* Mallory tips. Chances are he'll be able to find exactly the shape and size you need. And he can deliver it promptly—at *standard price!*

The Mallory standard electrode line is the widest anywhere. It includes straight electrodes with many nose shapes, tapers and lengths . . . scores of models of single and double bent electrodes, cold forged for extra hardness and life . . . cast and forged offset types in unusual shapes. Designs include exclusive Mallory features for extra service . . . such as the patented Mallory fluted cooling hole, and bent-in-place cooling tubes. Our electrodes are made with alloys developed during more than thirty years of pioneering in resistance welding materials.

And for that rare job that really needs special treatment, call on Mallory to design and make the custom-tailored electrodes that will give peak economy on your machines.

For prompt service and valuable help, see your local Mallory Welding Distributor. Write for the name of the one serving your area.

In Canada, made and sold by Johnson Matthey and Mallory, Ltd., 110 Industry Street, Toronto 15, Ontario

Serving Industry with These Products:

Electromechanical — Resistors • Switches • Tuning Devices • Vibrators
Electrochemical — Capacitors • Mercury and Zinc-Carbon Batteries
Metallurgical — Contacts • Special Metals • Welding Materials

OVER 30 YEARS OF RESISTANCE WELDING LEADERSHIP

P.R. MALLORY & CO. Inc.
MALLORY
P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

For information on titanium developments, contact Mallory-Sharon Titanium Corp., Niles, Ohio

Whatever type auto air-conditioning system you produce . .



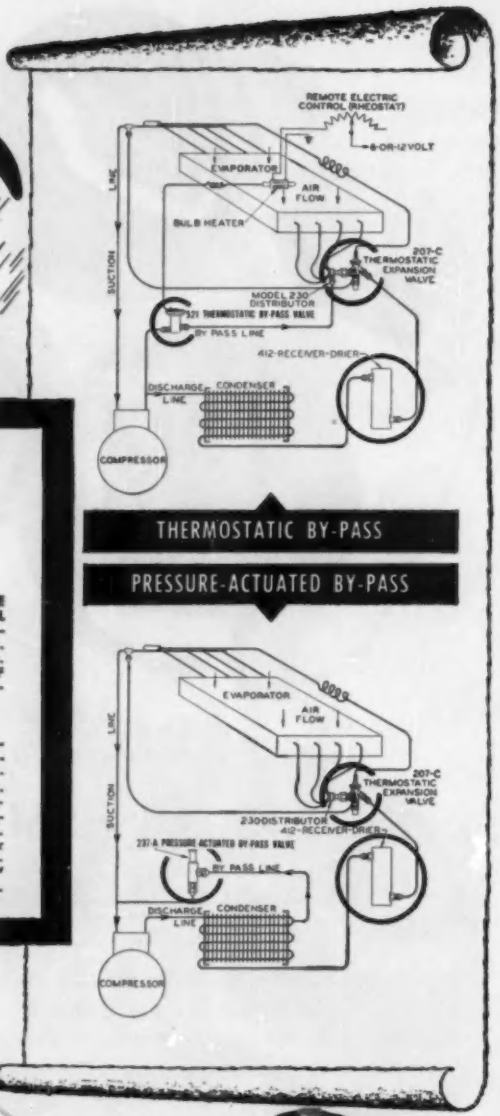
A-P is the only single source for complete air conditioning control "packages"



MODEL 521 TEMPERATURE ACTUATED BY-PASS CONTROL — Maintains constant comfort — opens on temperature drop. Liquid-charged power element. Adjusts: 55 to 80°F, 30 to 50°F for control of return air or evaporator temperature.



MODEL 237-A PRESSURE ACTUATED BY-PASS — Provides by-pass for car temperature. Control for or prevention of evaporator freeze-up. Extremely compact. Available with toggle for remote control. Connections: ⅜, ½ or ⅝" male flare inlet, outlet.



You name it — A-P has it! Offers you the most complete line of automotive air conditioning controls for popular systems. The thermostatic expansion valves, pressure regulator, drier-receiver and distributors shown are among the many devices approved by automotive air conditioning manufacturers.

A-P likes to work hand in hand with you on automotive air conditioning systems. Four years of experience in this rapidly expanding field helps us eliminate "bugs" for you in a hurry!

You'll also be interested to know that more than 400 refrigeration jobbers give you coast-to-coast coverage for future replacements. Write today for new comprehensive bulletin.



MODEL 207-C THERMOSTATIC EXPANSION VALVE—Adjustable or fixed superheat. Pressure limit on special order. Internal or external type equalizer. 1-ton or 1½ ton capacities, R-12.



MODEL 206-J THERMOSTATIC EXPANSION VALVE—Fixed superheat to order. Pressure limit on special order. Also with external equalizer (206-JE) 1 and 1½ ton R-12, 1¾ ton R-22.



MODEL 412 DRIER-RECEIVER with sight glass. PA-400 silica gel protects 100% against acids and moisture. Capacities: up to 3 tons.



PRESSURE-TYPE DISTRIBUTORS — uniform flow to all circuits. Any sizes and number of outlet openings; also side opening for by-pass connection if required.

CONTROLS COMPANY OF AMERICA

Manufacturers of A-P CONTROLS

2415 N. 32nd STREET

MILWAUKEE 45, WISCONSIN

Controls That Make Modern Living Possible

WIDELY USED IN THE FIELD

Chrysler Corp.
American Motors Corp.
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Ford Motor Co.
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Ford Motor Co.
Mercury Div.
A.R.A. Mfg. Co.
Capital Refrig. Co.
Clardy Auto Air Conditioning Co.
Climate Air Mfg. Co.
Forston Mfg. Co.
Frigiker Corp.
Frigiquip Corp.
National Gas Equip. Co.
John E. Mitchell Co.

TRUCK UNITS

Tranter Mfg. Co.
American Mfg. Co.

XXII

This is the twenty-second of a series of advertisements dealing with basic facts about alloy steels. Though much of the information is elementary, we believe it will be of interest to many in this field, including men of broad experience who may find it useful to review fundamentals from time to time.

Normalizing Alloy Steels

There are several forms of heat-treatment commonly employed in the processing of alloy steels. Each in its own way modifies the mechanical properties and structures of steel, and each is chosen with a definite objective in mind. The five usual forms of treatment are normalizing, annealing, spheroidize-annealing, quenching and tempering, and stress-relieving.

In this particular discussion, let us consider briefly the purposes and effects of normalizing.

Normalizing is an operation in which the steel is heated to approximately 100 deg F above the upper transformation range, then cooled in still or agitated air. The basic purpose is to refine the prior structure produced by variations in finishing temperatures encountered in rolling or forging. The structure resulting from normalizing, being more uniform, will help create improved mechanical properties when the steel is subsequently reheated, liquid-quenched, and tempered.

There are times when large steel parts (heavy forgings, for example) cannot be liquid-quenched because of their size. In cases of this nature, the heat-treatment must consist of single or multiple normalizing followed by tempering.

High-temperature normalizing is sometimes used for grain-coarsening low-carbon alloy steels to promote machinability. (In high-temperature normalizing, steel is heated to more than 100 deg F above the upper transformation range.) At times it is possible to machine a steel in the air-cooled condition, the governing factor being the alloy content. However, the highly alloyed analyses may require annealing or tempering after normalizing, to decrease the hardness.

It is essential, when normalizing is employed, that free circulation of still or agitated air be provided. When air-cooling of individual bars or forgings is not practicable, the furnace charge should provide for some means of separation, such as racks or spacers.

If you would care to know more about normalizing, or any other phase of heat-treating, you are invited to consult with Bethlehem metallurgists. They have had long experience in such matters, and they know how each treating method affects the various alloy steels. They are always glad to give you any help you need.

And when next in the market, please remember that Bethlehem makes the full range of AISI standard alloy steels, as well as special-analysis steels and all carbon grades. We can furnish what you need.

If you would like reprints of this series of advertisements from No. I through No. XX, please write to us, addressing your request to Publications Department, Bethlehem Steel Company, Bethlehem, Pa. The first 20 subjects in the series are now available in a handy 36-page booklet, and we shall be glad to send you a free copy.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL



To **engineers** whose creative energies are being cramped by routine duties...

DOUGLAS GIVES YOU PLENTY OF "ELBOW ROOM" TO USE YOUR FULL TALENTS!

Become a part of a crack engineering team building for tomorrow... yet enjoying the rewards of accomplishment today. If you're tired of the routine, let your creative energies express themselves at Douglas. Whatever your engineering field, you will assure yourself a rewarding career by taking advantage of the many opportunities Douglas offers, such as...

KEY OPENINGS FOR MECHANICAL AND STRUCTURAL DESIGN ENGINEERS! Aeronautical, Mechanical and Civil Engineers design, develop and test aircraft components from original design stage through flight test.

For important career opportunities in your field, write:

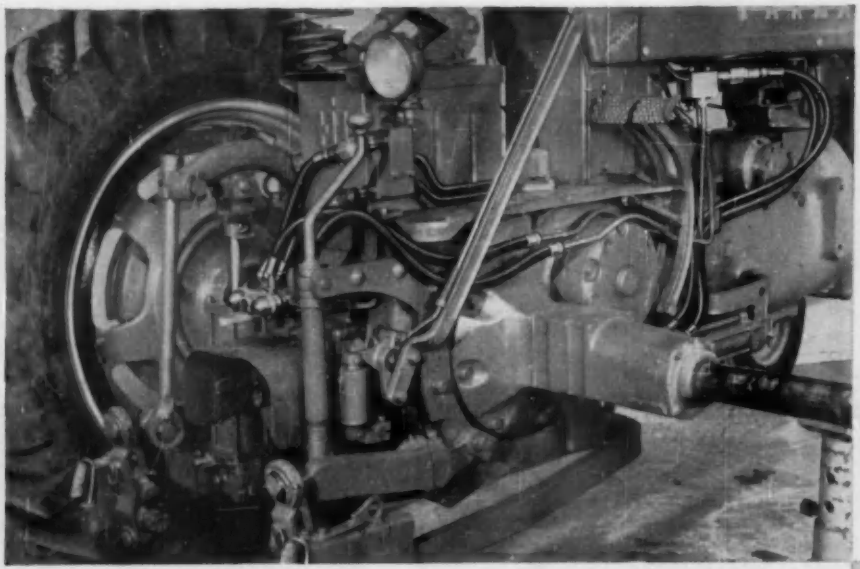
C. C. LaVENE
DOUGLAS AIRCRAFT COMPANY, BOX C-620
SANTA MONICA, CALIFORNIA

Go further with **DOUGLAS**

FIRST IN AVIATION


Warco PRESS
Federal-Warco
"PACKAGED"
METAL-WORKING LINES
Federal
Federal
Federal
Automated production
From basic metal to finished product
Here's one source responsibility for the design, construction and service of a complete line for the production of almost any metal part or product.
Whatever is required—drilling, machining, forming, welding, etc.—is designed into basic line—conserving space, taking advantage of common drives and integrated feeding and eliminating multiple service responsibility.
You'll want to know more about this sensible approach to modern metal fabrication. Have a Federal-Warco engineer show you one of these packaged lines in actual operation soon.
Federal WELDERS
THE FEDERAL MACHINE AND WELDER COMPANY
Warco PRESSES
WARREN, OHIO

263



INTERNATIONAL HARVESTER'S McCORMICK FARMALL 400
Tractor controls every implement action hydraulically through its famous Hydra-Touch hydraulic system. Individual, closely grouped levers permit independent or unison control of cylinders.

HYDRAULIC POWER . . . DELIVERED THROUGH

Eastman

HYDRAULIC HOSE ASSEMBLIES . . .

Most competitive Farm Implement Sales Feature

HYDRAULIC POWER probably contributed more to the usefulness, efficiency, and easy operation of farm tractors than any other modern engineering development. Farmers appreciate hydraulic advantages so much that they have become one of the *most competitive features in implement and tractor sales promotion.*

EASTMAN MANUFACTURING COMPANY is proud to have among its many agricultural users the International Harvester Company—dating back to the first McCormick Reaper—in 1831. Eastman—*first in the field* of Hydraulic Hose Assemblies—lists many other agricultural implement manufacturers among its users: J. I. Case, Allis-Chalmers, Massey-Harris-Ferguson, Inc., Minneapolis-Moline, Farmhand, Avco, and others.

IMPROVE THE COMPETITIVE POSITION OF YOUR PRODUCTS with Hydraulic Power—delivered through Eastman Hydraulic Hose Assemblies. Always specify Eastman: First in exclusive engineering advantages and design! First in materials and workmanship! *First in the field* of Hydraulic Hose Assemblies!

WRITE Send your specifications and blueprints for our original equipment quotations.





HYDRAULIC POWER controls plow penetration and depth automatically, lifting and locking in traveling position.



HYDRAULIC POWER controls angle and depth of disc penetration on International Fast-Hitch Bush and Bog Harrow.



HYDRAULIC POWER enables Farmall 200 Hydra-Creeper to travel 1/5 to 1 mile per hour for transplanting.



HYDRAULIC POWER permits raising right, left, or rear cultivator gangs separately, together, or any combination.



Eastman
first in the field
MANUFACTURING COMPANY
Dept. AI-6, Manitowoc, Wis.

USS STAINLESS STEEL



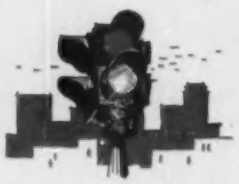
Don't scratch your nose

We mean don't scratch your nose at an *auction*, or you may end up, as in the drawing, with a house full of eagles, urns and George-Washington-slept-in-it bedsteads. But what a wonderfully capacious station wagon they have to lug it all home in!

Of course, the vehicle isn't real. But there's nothing make-believe about the Stainless Steel you see on *all* cars. No other metal resists denting and corrosion so well, and Stainless is surely the easiest of all metals to keep clean and bright. Then too, Stainless trim is often cheaper to fabricate than plated parts.

As a *source* for Stainless Steel, we would like to recommend ourselves: United States Steel, a reputable concern that can furnish the finest references. We also have a crack metallurgical staff, and the widest range of Stainless types, grades and finishes. If you'd like a large reproduction of the above drawing, write to United States Steel, Room 2801, 525 William Penn Place, Pittsburgh 30, Pa.

Drawing by Marie Tuccillo Kelly.
Reproductions available on request.



Cushioned impact of "stops" and "starts"



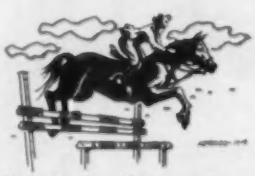
Self alignment of springs, frame, and axles



Load balance control



Sidesway control



Shock absorbing action

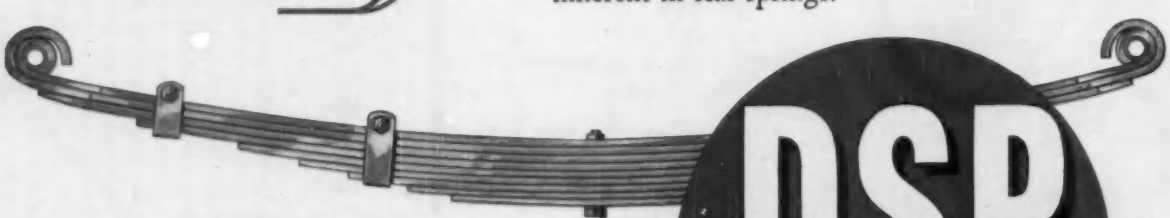
You get all these BUILT-IN FEATURES

Plus

basic leaf-spring economy for both manufacturer and customer

Leaf springs can be designed to fit any desired ride condition.

In every instance, they will also include the "built-in" features shown above PLUS the basic economy inherent in leaf springs.



DSP *Leaf* **SPRINGS**

DETROIT STEEL PRODUCTS DIVISION

OF *Fenestra* INCORPORATED

1500 Trombly Avenue, Detroit 11, Michigan

SINCE 1904—ORIGINAL EQUIPMENT ON CARS, TRUCKS, CABS, BUSES, TRAILERS

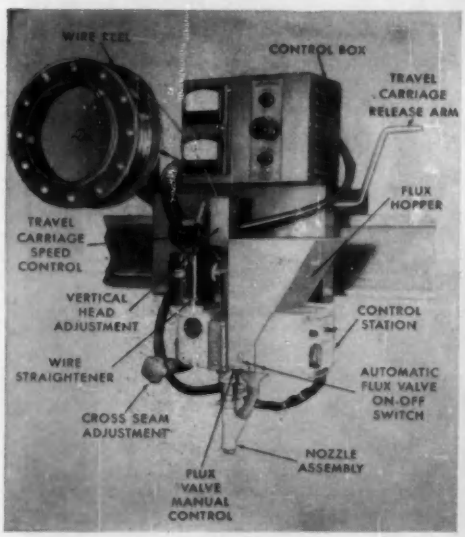
Production Increased 35%

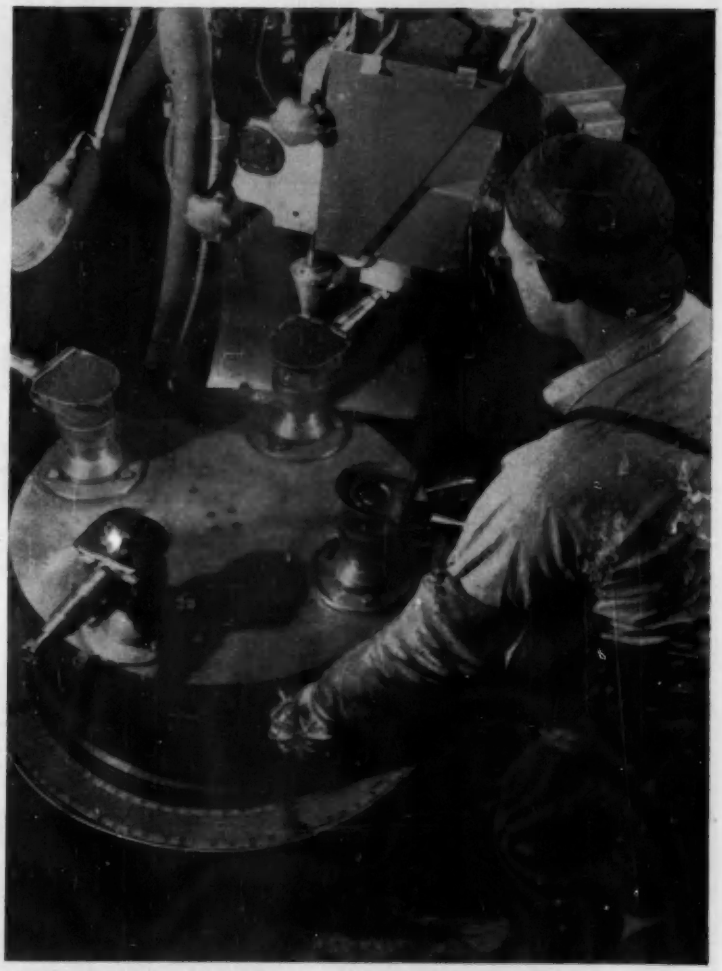
with LINCOLNWELD

Automatic Submerged Arc Welder

HERE steering knuckles for tractors are produced by Lincolnwelding a forging to a spindle. Production has been increased from 56 to 76 pieces per hour. Welding cost has been reduced $1.80 per hundred pieces.

Cost reducing benefits like these are possible on many types of fabrication with the dependable Automatic Lincolnweld. Call in the Lincoln Welding Engineer in your city. Ask him for a recommendation of how Lincolnweld can cut your costs.





Welding steering knuckles for tractors with LINCOLNWELD automatic submerged arc welder. Courtesy of International Harvester Company, Milwaukee, Wisconsin.

THE

LINCOLN ELECTRIC

COMPANY

Cleveland 17, Ohio

The World's Largest Manufacturer of Arc Welding Equipment

For details and specifications of Automatic Lincolnwelds, send coupon for Bulletin SB-1355.

Fill out and mail to:
The Lincoln Electric Company
Dept. 1003, Cleveland 17, Ohio

☐ Send Bulletin SB-1355.
☐ Have Welding Engineer call.

Name_____
Company_____
Street_____
City_____ Zone____ State_____
Position_____



Safety
Comfort
Economy

MONROE

The Greatest name in Ride Control



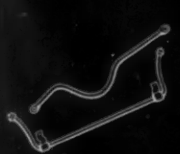
MONRO-MATIC SHOCK ABSORBERS — Standard on more makes of cars than any other brand.



MONROE AIR-O-STEER Power steering for air-equipped trucks, buses. Installed in 2 hours.



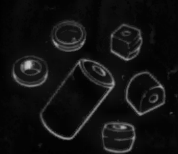
DIRECT ACTION POWER STEERING — The only truly direct-action Power Steering units available.



MONROE SWAY BARS — Specified as standard equipment on 15 makes of passenger cars.



E-Z RIDE SEATS — Standard on more tractors than all other seats of this type combined.



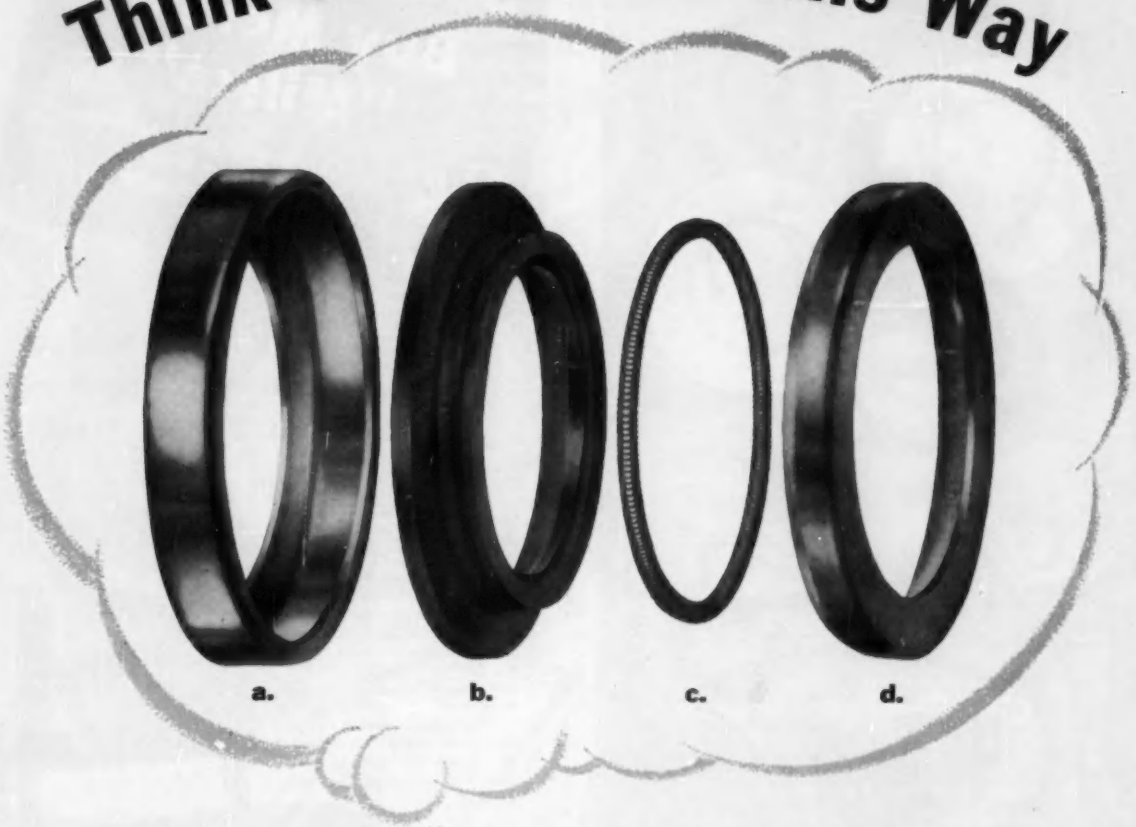
MOLDED RUBBER PRODUCTS — Precision-built for all automotive and industrial applications.

MONROE AUTO EQUIPMENT COMPANY

Monroe, Michigan—World's Largest Maker of Ride Control Products

When you design-in seals

Think of Oil Seals This Way



a. Outer Case

Formed to extreme close tolerance of heavy gauge steel with sufficient structural strength to maintain precision dimension.

b. Sealing Lip

Properly prescribed material either compounded or processed for application conditions of temperature and eccentricities. Precisely molded for correct shaft interference, low torque and positive sealing.

c. Tension Spring

Carefully engineered as to metallurgy, heat treatment and coil diameter to provide uniform compressive force on the sealing element.

d. Inner Case

Strengthens, protects; sturdy gauge steel formed to close tolerances.

4227

A good oil seal is a carefully engineered, precision manufactured assembly of carefully engineered, precision manufactured components. Each part must be exactly right *for the given application* or the seal will not function properly.

You avoid dangers of costly retooling, remanufacture or premature replacement when seals are correctly specified during your product's design stage. Each sealing application is different; many designers use National's field engineering service to be sure correct—and latest—oil seals are used.

Why "do it yourself?" Call the National Seal field engineer now. His service involves no obligation.

NATIONAL SEAL
DIVISION, Federal-Mogul-Bower Bearings, Inc.
GENERAL OFFICES: Redwood City, California
PLANTS: Van Wert, Ohio, Redwood City and Downey, California

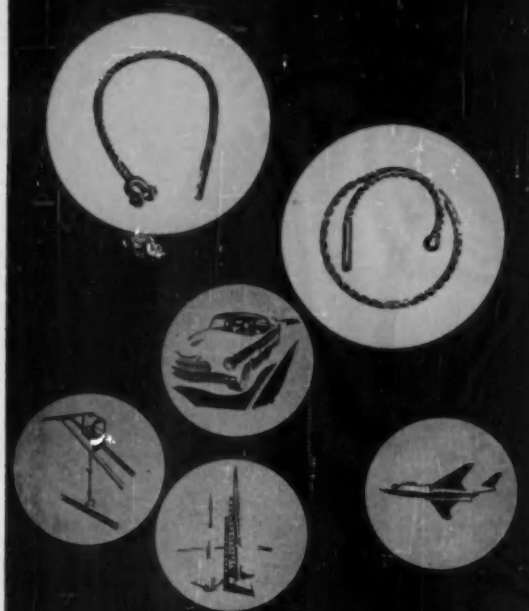
CATALOGS IN SWEET'S



36th year

CHICAGO, ILL. . . *Room 462, McCormick Building, HArrison 7-5163*
CLEVELAND, OHIO . *210 Heights Rockefeller Bldg., YEllowstone 2-2720*
DETROIT, MICH. . . . . *13836 Puritan Avenue, VEremont 6-1909*
INDIANAPOLIS, INDIANA . *2802 North Delaware Street, WAlnut 3-1535*
MILWAUKEE, WIS. . . *647 West Virginia Street, BRoadway 1-3234*
NEWARK, N. J. . . . . *1180 Raymond Blvd., Mitchell 2-7586*
DOWNEY (Los Angeles County), CALIF. . . *11634 Patton Road, TOpaz 2-8163*

BERGEN
wire rope assemblies



Custom-ENGINEERED
TO SERVE YOU BEST

No matter what type of assembly is required . . . swaged, spliced or socketed fittings . . . Bergen engineers will help you find the most effective and economical units.

Bergen quality control techniques and special inspections assure you **better materials, better craftsmanship . . . better performance** and the strongest assemblies ever made.

Cable terminals can be either standard, AN type, commercial, or individually designed. For complete information, write today.

PRODUCTION GEARED TO MAKE FAST DELIVERIES

BERGEN
WIRE ROPE COMPANY
51 GREGG STREET, LODI, N. J.

SERVING THE LEADERS OF INDUSTRY

Seating Dollars Buy More at "Milsco"



- √ Complete engineering facilities
- √ Large, modern factory
- √ Field-tested seating for your satisfaction

NOW! The MILSCO "THRIFT-KING" SEAT IN **2** POPULAR SIZES AND STYLES

"THRIFT KING"

The Milsco "Thrift-King" seat is the nation's greatest seating value, and the demand has spread to the trucking industry, lift trucks, power mowers and many types of mobile equipment.

The strong welded angle iron frame in the "Thrift-King" has stood the test, and will add "sales-appeal" to your product.



MILSCO F-1105
Complete with folding backrest and padded with bonded foam rubber. Covered with brown Spanish grain Naugahyde. Fore and aft adjustment. Frame brown.
Front to rear . . . 19¼"
Left to right . . . 15⅜"

MILSCO F-1130
Complete with folding backrest and padded with bonded foam rubber. Covered with black imitation leather. Frame black. Center bar for easy attaching. Less fore and aft adjustment.
Front to rear . . . 19"
Left to right . . . 17⅜"

NOTE: "Thrift-King" seats can also be had with stationary backrest.

Write today for complete details.

AMERICA'S most versatile manufacturer of cushion seating . . .

Milsco
MILWAUKEE

2730 No. 33rd ST., MILWAUKEE 45, WIS.

TDA® BRAKES

if it moves...we can stop it

new "DM" brake

...farm equipment
...special duty utility trailers
...lightweight highway trailers
...industrial machinery



"DM" DUPLEX MECHANICAL BRAKE



Best on many jobs, this rugged new DM Brake actually outperforms more specialized brakes. It has proved its worth with farm equipment, special duty utility trailers, light duty highway trailers, industrial machinery, and in a wide variety of special applications.

Greater torque output! The DM Brake is a self-energizing, balanced type . . . the two identical shoes do an equal amount of work in either forward or reverse direction.

Simpler Maintenance and Adjustment!

The DM Brake is wedge-actuated through an easily accessible operating lever, giving positive braking with immediate response. The DM Brake can be actuated by either an air or hydraulic cylinder, or mechanical means. Complete accessibility permits quick, easy adjustment. Simple design keeps maintenance and service at a minimum.

©1956, RS&A Company

TIMKEN Detroit BRAKES
ROCKWELL SPRING AND AXLE COMPANY
Accepted TDA Standard

For every industrial, agricultural or automotive application where braking is required!

TDA Plants at: Detroit, Michigan • Oshkosh, Wisconsin • Utica, New York
Ashtabula, Kenton and Newark, Ohio • New Castle, Pennsylvania

Timken-Detroit Brake Division
Rockwell Spring & Axle Company
Dept. AI-67, Ashtabula, Ohio

Please send me further information on your "DM" Series Brake.

Name _____ POSITION

Company _____

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A New and Better Chrome Carbide

CARMET Grade CA-815

FOR HOT EXTRUSION DIES



BETTER RESULTS

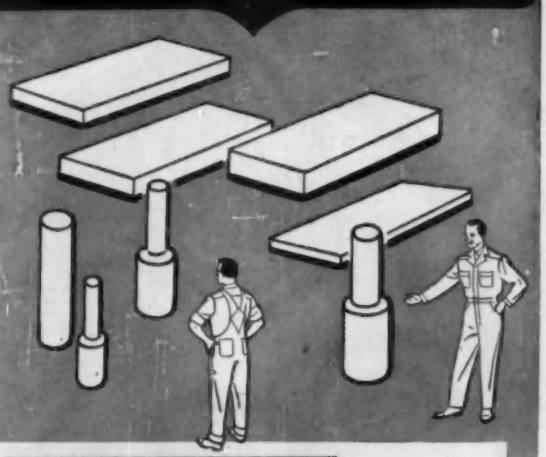
BETTER DIE LIFE
because of . . . High resistance to oxidation at elevated temperatures.

BETTER SIZE CONTROL
because of . . . Excellent wearability.

BETTER BAR FINISH
because of . . . High hot hardness.

LESS PICKUP AND GALLING
because of . . . Less affinity towards other metals.

FOR PRECISION GAGING



BETTER RESULTS

MORE ACCURATE GAGING
because of . . . Coefficient of expansion close to that of steel.

EXCELLENT SURFACE FINISH
because of . . . Low porosity.

EASY MAINTENANCE
because of . . . High resistance to corrosion.

LONGER GAGE LIFE
because of . . . Excellent wearability.

Write for the NEW
CARMET CATALOG



. . . Completely revised, the 16th Edition of the Carmet Catalog contains the latest information on all Carmet grades, and on Carmet blanks, tools, die sections, etc.; also gives details on special preforming and how to order special parts.

Address Dept. AI-90

Now for the first time a completely homogeneous chrome carbide is available . . . Carmet CA-815. Grade CA-815 is ideally suited for such operations as the two illustrated above . . . or for *any* application where resistance to corrosion as well as resistance to abrasion are a factor.

Carmet CA-815 is manufactured under controlled conditions. Die and gage makers are assured of complete dimensional accuracy and excellent surface conditions. Only minimum amounts of stock are left for finishing.

For further information on this and other Carmet carbide grades, call your Carmet Engineer . . . or write *Allegheny Ludlum Steel Corporation, Carmet Division, Detroit 20, Mich.*

For ALL your CARBIDE needs, call

Allegheny Ludlum

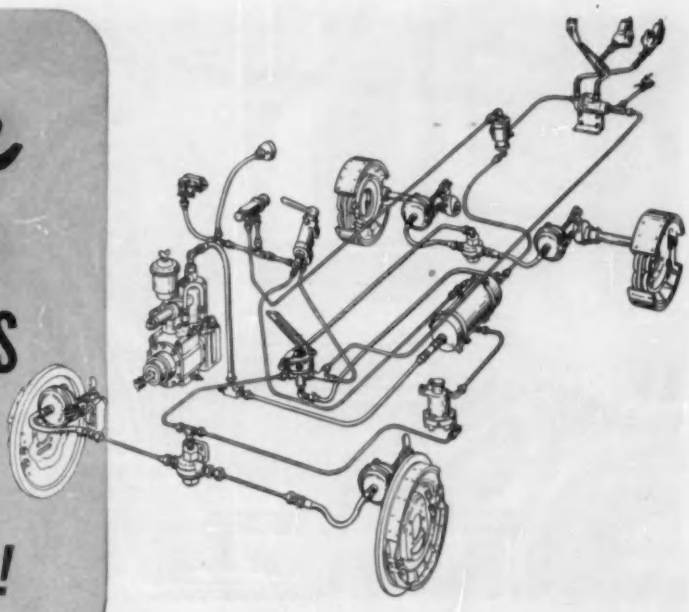
WSW 6188

AL

FINE TOOL STEELS SINCE 1854

Wagner

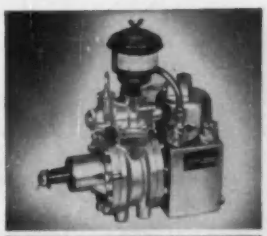
STRAIGHT AIR BRAKE SYSTEMS *provide safe, sure stops for cam type brakes!*

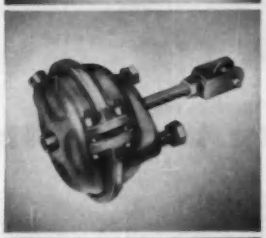


Wagner Straight-Air Brake actuating systems give cam type foundation brakes the ability to make quick, safe stops—completely controlled by the driver. They are furnished plenty of air at all times by the Wagner Rotary Air Compressor. The actuating units and application valves are *positive* in operation—performance-proved on many thousands of installations.

Wagner Air Brakes are the product of more than thirty years of brake engineering experience—gained in the designing and building of brake systems and brake parts for the automotive industry. When you equip the heavy-duty vehicles you manufacture with Wagner Air Brakes, you are adding safety and low-maintenance features that build customer acceptance.

Get all the facts on the Rotary Compressor and other features that make Wagner Straight-Air Systems so dependable and so safe. Write for your free copy of Catalog KU-201—it gives all the facts you should know about Wagner Air Brake Systems.







features include:

WAGNER ROTARY AIR COMPRESSOR — provides an abundance of air at all times. Its cool operation prevents carbon formation in air lines. Uniform torque load and smooth operation with moderate stresses assure long compressor life and long belt life.

WAGNER BRAKE CHAMBERS—have diaphragms of neoprene rubber bonded to high-tensile-strength nylon fabric for superior oil resistance and maximum strength and flexibility. Available with or without push-rod seal. All brake chamber parts are of corrosion-resistant material, or are plated to prevent rusting. Wagner Brake Chambers are interchangeable with all clamp type and bolt type units equipped with standard mounting studs, regardless of make.

WAGNER MOISTURE EJECTION VALVE—automatically keeps air reservoirs clean and dry by ejecting accumulated moisture with each average brake application—without causing a noticeable drop in tank pressure.

R57-11



Wagner Electric Corporation
6363 PLYMOUTH AVENUE, ST. LOUIS 14, MO., U. S. A.
(Branches in principal cities in U. S. and in Canada)

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For enduring beauty that sells in a new car and re-sells in a used car . . . design it, improve it and protect it with McLOUTH STAINLESS STEEL.

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HIGH QUALITY SHEET AND STRIP

for automobiles

McLOUTH STEEL CORPORATION DETROIT, MICHIGAN

MANUFACTURERS OF STAINLESS AND CARBON STEELS



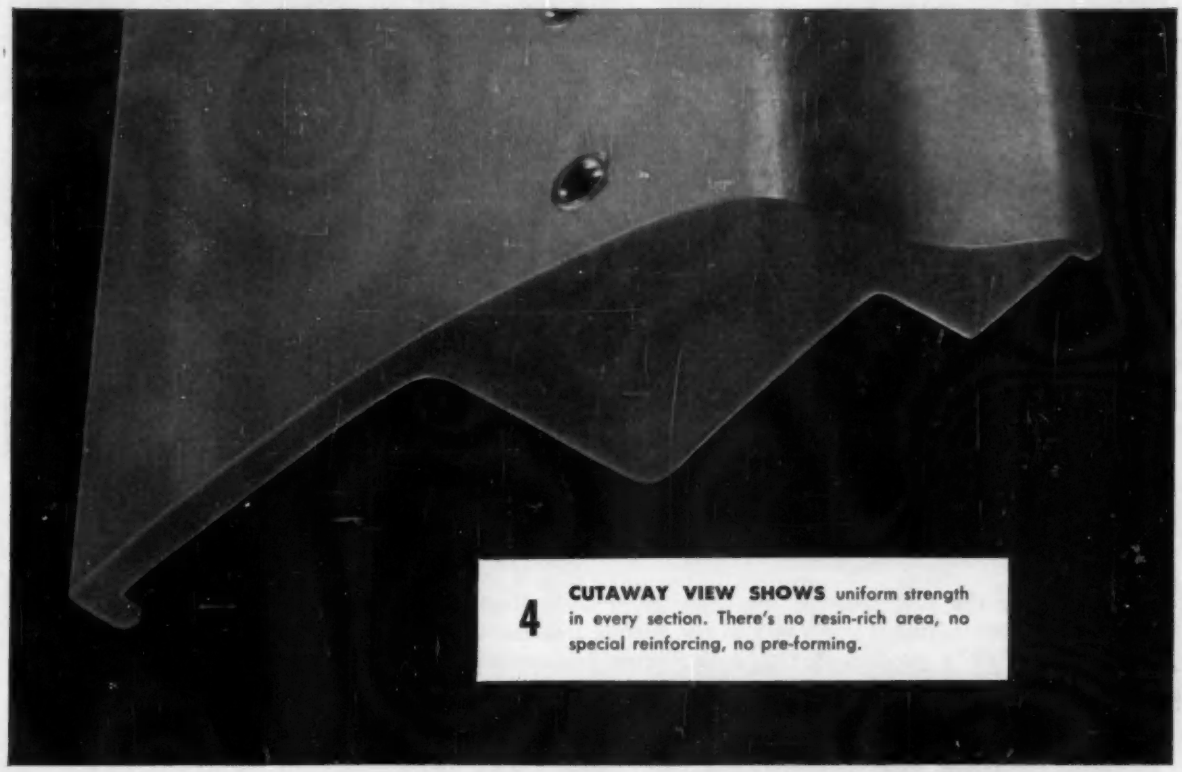
1 This premix consists of reinforcing material, such as fiber glass or sisal, thoroughly mixed with polyester resin containing Dow Styrene.



2 The premix molding compound flows evenly to each and every section of the closed die as it is compressed under heat and pressure.



3 After a very short cycle, the finished premix molding is removed from the die. It is now ready for immediate assembly or shipment.



4 **CUTAWAY VIEW SHOWS** uniform strength in every section. There's no resin-rich area, no special reinforcing, no pre-forming.

For lower bids: premix moldings

For uniform strength: polyester resin with Dow Styrene

Many complicated parts—especially parts with varying wall thicknesses—are now made better, at lower cost, by premix molding. There are no resin-rich areas. Strength is uniformly distributed. Pre-forming is eliminated. And holes and nozzles can be molded in a part, eliminating punching and drilling operations.

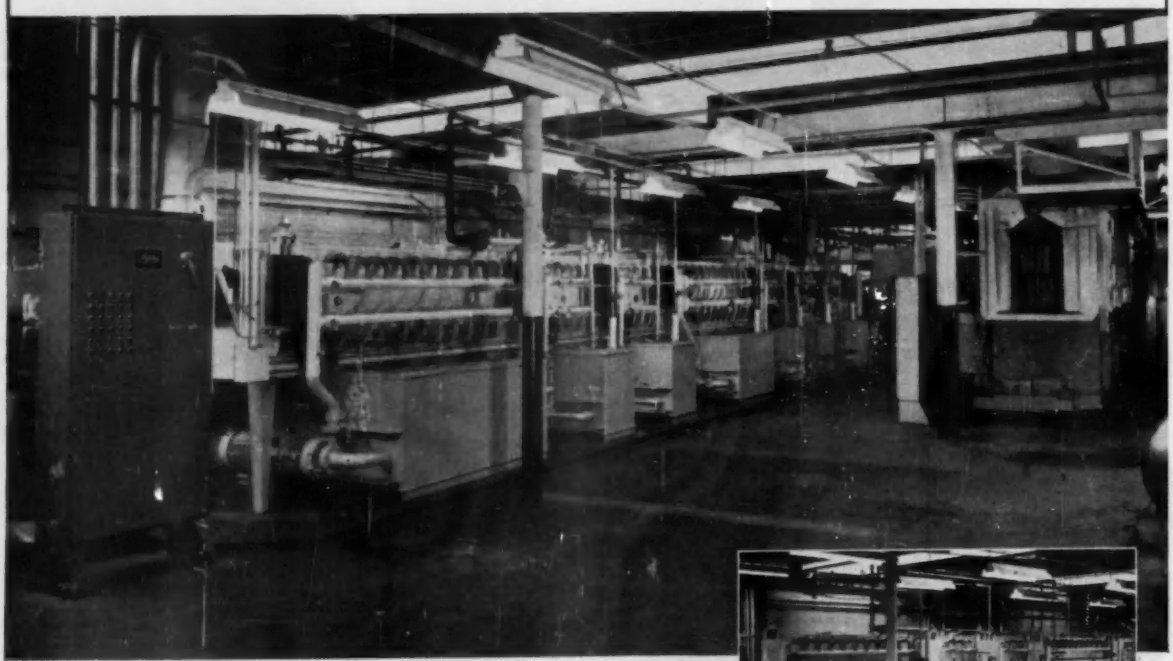
Leaders of the automotive and appliance industries have proved the benefits of premix moldings for specific parts. Many innovations are now on the drawing boards.

The product shown is an example of the many now being made by premix molding using Dow Styrene. For technical assistance on Dow Styrene, write THE DOW CHEMICAL COMPANY, Midland, Michigan – Plastics Sales Department PL1886G

Photographs through the courtesy of Fabricon Products, River Rouge, Michigan

YOU CAN DEPEND ON DOW

First in the Nation



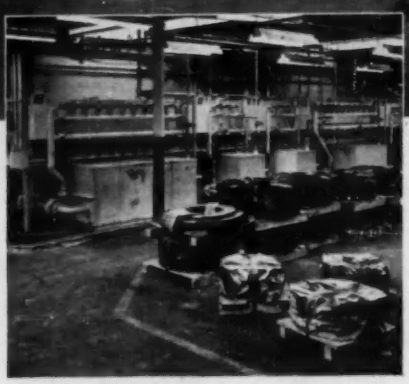
1. 75-foot continuous treatment strip machine, left, and automatic Spra Bonderite, right, in Parker's new customer service lab.

Now, for the first time in the industry, Parker Rust Proof Company brings you a way to test surface treatment of metals on a production line basis, *before* you install surface treatment equipment in your plant.

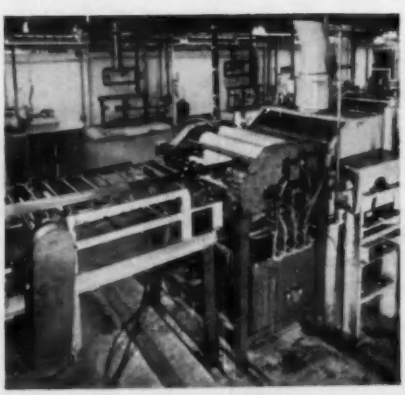
You can save time, trouble and money by making use of the extensive research facilities of Parker's unique new customer service laboratory. It's a research lab with production line equipment, run like a production line.

This automated lab can treat sample stock by the ton. It is equipped to prepare samples and conduct tests involving all of Parker's varied and outstanding surface treatments of metals.

If you have a metal surface treatment problem, you are cordially invited to make use of this new testing service. Just contact your nearest Parker representative, or write or call Parker Rust Proof Company.



2. Tons of steel in coils await treatment in the strip and sheet treating machine.



3. Bonderlube is applied over Bonderite treatment for cold forming sample. Roller coating section at end of strip machine is interchangeable.

PARKER
RUST PROOF COMPANY
2178 E. MILWAUKEE, DETROIT 11, MICHIGAN

Since 1914—leader in the field

New Thompson automatic Truck Retarder insures extra safety!

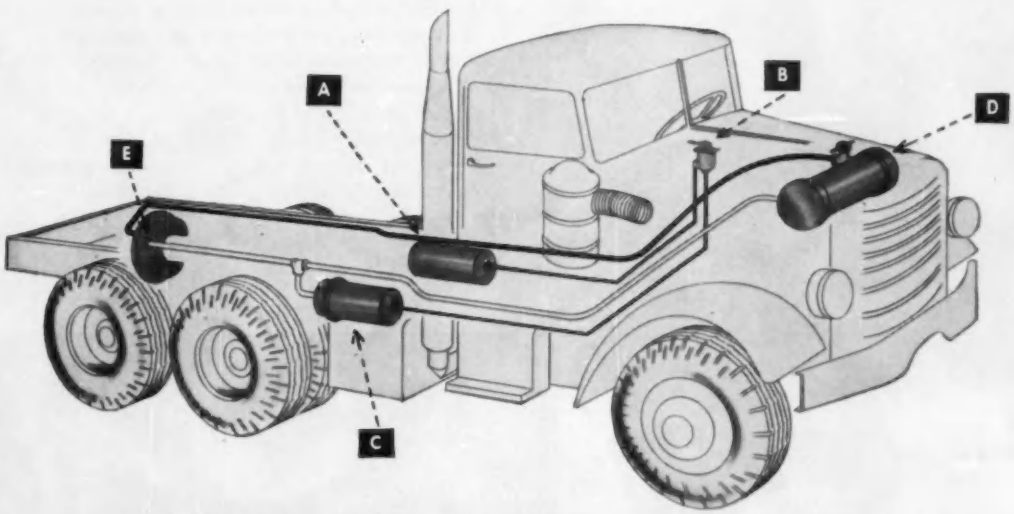
Radical new development means greater driver-control on highways, hills and dangerous curves . . . plus longer truck life

WITH today's higher highway cruising speeds and heavier payloads, Thompson's revolutionary new hydraulic Truck Retarder . . . light, compact and powerful . . . now provides an *extra* safety margin for trucks and tractors of *any* size.

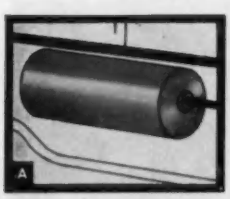
The Thompson Truck Retarder works COMPLETELY INDEPENDENTLY of the vehicle's service and emergency brakes!

The efficiency of a more dependable braking system . . . due to the use of this Thompson-developed *auxiliary* braking system . . . means less costly wear and tear on the service *and* emergency brakes. This results in fewer road breakdowns . . . less time in repair shops . . . and lower maintenance costs and longer truck life for truck and fleet owners.

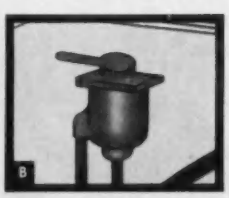
For complete technical information write, wire or phone Michigan Division, Thompson Products, Inc., 34201 Van Dyke, Warren, Michigan.



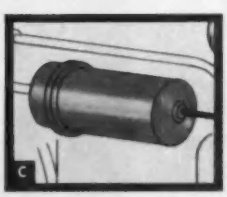
How the Thompson truck retarder works



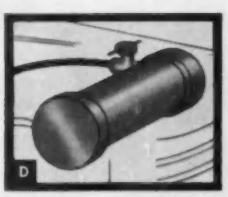
REGULAR AIR SYSTEM supplied on the vehicle also provides the air used by the auxiliary braking system. As an additional safety feature a compressed air reservoir can be applied for emergency use in case the regular air system fails.



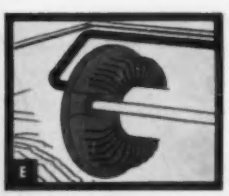
CONTROL VALVE, located in the cab and operated by hand, supplies air from the service brake system to the loading cylinder.



LOADING CYLINDER supplies retarder fluid which is forced under varying air pressures to the retarder. When the retarder is not required, fluid is pumped back into loading cylinder.



HEAT EXCHANGER, located within the engine compartment, dissipates the heat through the vehicle's cooling system.



THOMPSON RETARDER—"heart" of the system. Fluid from the loading cylinder strikes against the revolving vanes of the rotor, slowing the vehicle without use of service brakes, leaving them cool for maximum efficiency.

You can count on TP **Thompson Products**

MICHIGAN DIVISION: WARREN AND PORTLAND

OSBORN BRUSHING METHODS *worthy of your confidence*

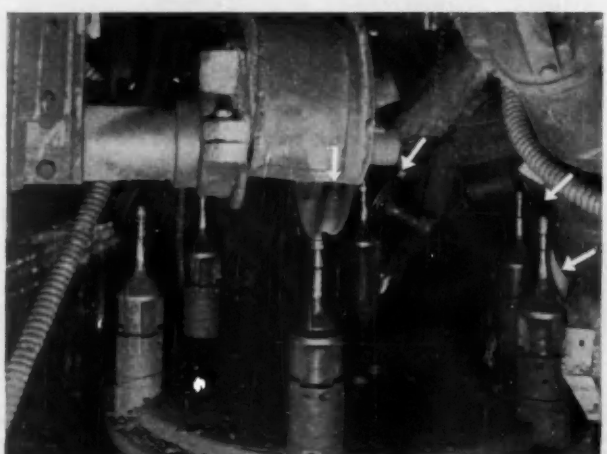
6-second finish



THE efficient job performance demanded of these cylindrical steel cams requires the proper finishing of their many surfaces. Power brushing proved to be the most effective method for removing the sharp edges and small burrs.

In the operation shown below, Osborn Power Brushes mounted on an automatic rotary machine remove minute burrs and blend surface junctures. This is done on a 6-second cycle . . . quickly, accurately and economically.

An **O**sborn **B**rushing **A**nalysis, made in your plant at no obligation, may point the way for improvements in your operations. Write *The Osborn Manufacturing Company, Dept. E-53, Cleveland 14, Ohio.*



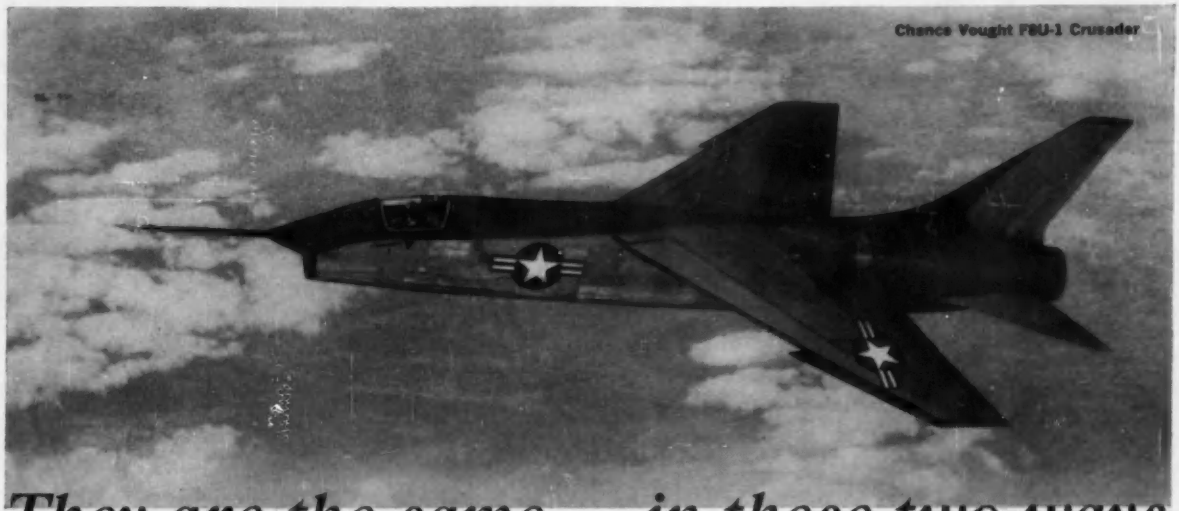
Four Osborn Monitor® Brushes remove burrs and produce accurately finished parts.

Write TODAY for the new 100-page Osborn Catalog 210-C

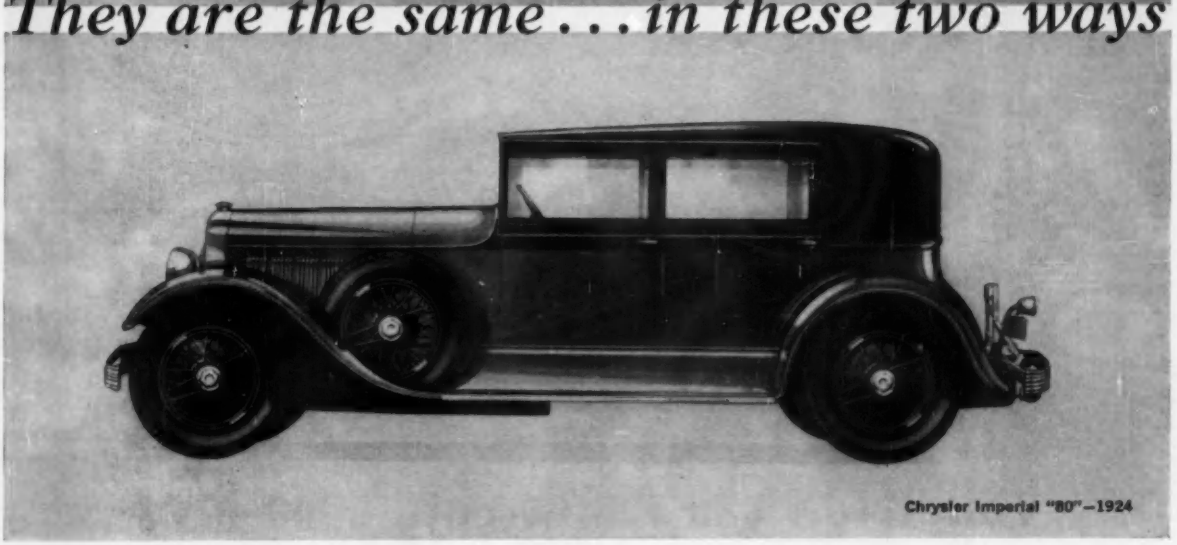
Osborn Brushes



BRUSHING METHODS • POWER, PAINT AND MAINTENANCE BRUSHES • BRUSHING MACHINES • FOUNDRY MOLDING MACHINES



They are the same . . . in these two ways



. . . engineering leadership and filtration by Purolator!

Thirty-four years ago, that Chrysler came off the assembly line equipped with something entirely new: an oil filter. By 1956 when the Chance Vought F8U-1 Crusader shattered the national speed record, filters were accepted as basic components on all automobiles and aircraft. Both events were milestones – both vehicles were protected by Purolator.

The 1924 Chrysler seems a relic of another age, while the Crusader is as new as tomorrow. But the concept that got its start with the Chrysler has become fundamental everywhere . . . any fluid – be it air, fuel, lube oil, hydraulic fluid or anything else—which is vital to the proper operation of any aircraft, automobile or machine, must be filtered to be kept free of contamination.

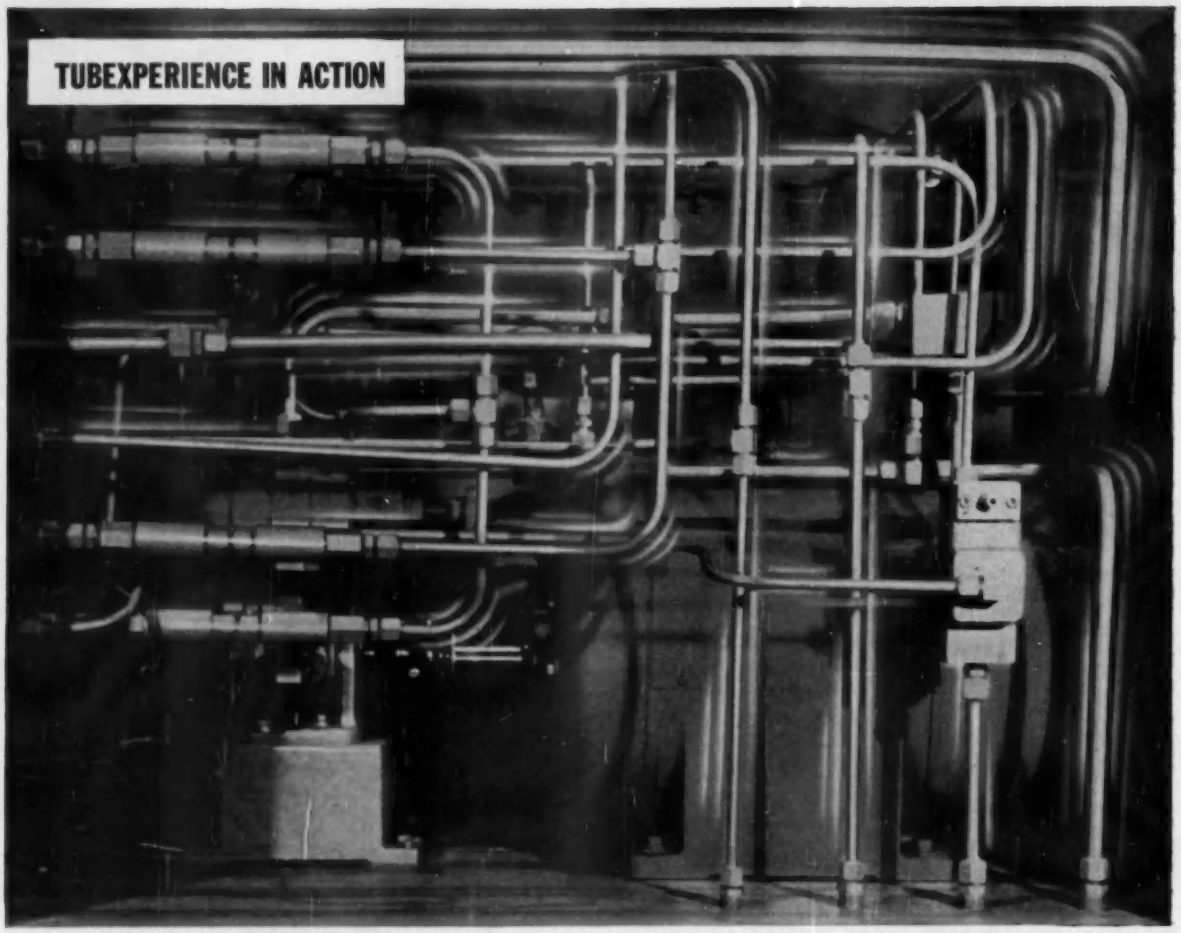
Purolator makes filters for every fluid known to man—for use in any conceivable application. The unique background of specialized know-how enables them to produce the best possible filters for the specific needs of the automotive industry – no matter what they are or when they arise.

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Rahway, New Jersey and Toronto, Ontario, Canada



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Superior hydraulic tubing is available through leading warehouse distributors from coast to coast. Contact the one nearest you today for information—or get a free copy of Bulletin 39 by writing to Superior Tube Company, 2020 Germantown Ave., Norristown, Pa.

HERE'S WHY SUPERIOR (SAE) HYDRAULIC TUBING WILL GIVE YOU LONGER, MORE ECONOMICAL SERVICE

High ductility! *Furnished in dead-soft annealed temper, Superior hydraulic tubing flares easily, bends without pinching, can be readily fabricated for any hydraulic application.*

Non-aging steel! *All Superior hydraulic tubing is made of selected non-aging steel. It keeps its ductility, will not become brittle with age. Carbon content is limited to .12% maximum.*

Bright, smooth, clean! *Special processing gives Superior hydraulic tubing an unusually bright, smooth, clean finish on both OD and ID; reduces turbulence and pressure drop. Shipped with special rust preventive coating on both inside and outside surfaces.*

Fully tested! *And not mere random sample testing! Every length of Superior (SAE) hydraulic tubing is 100% hydrostatically tested at maximum working pressure—giving you realistic performance insurance.*

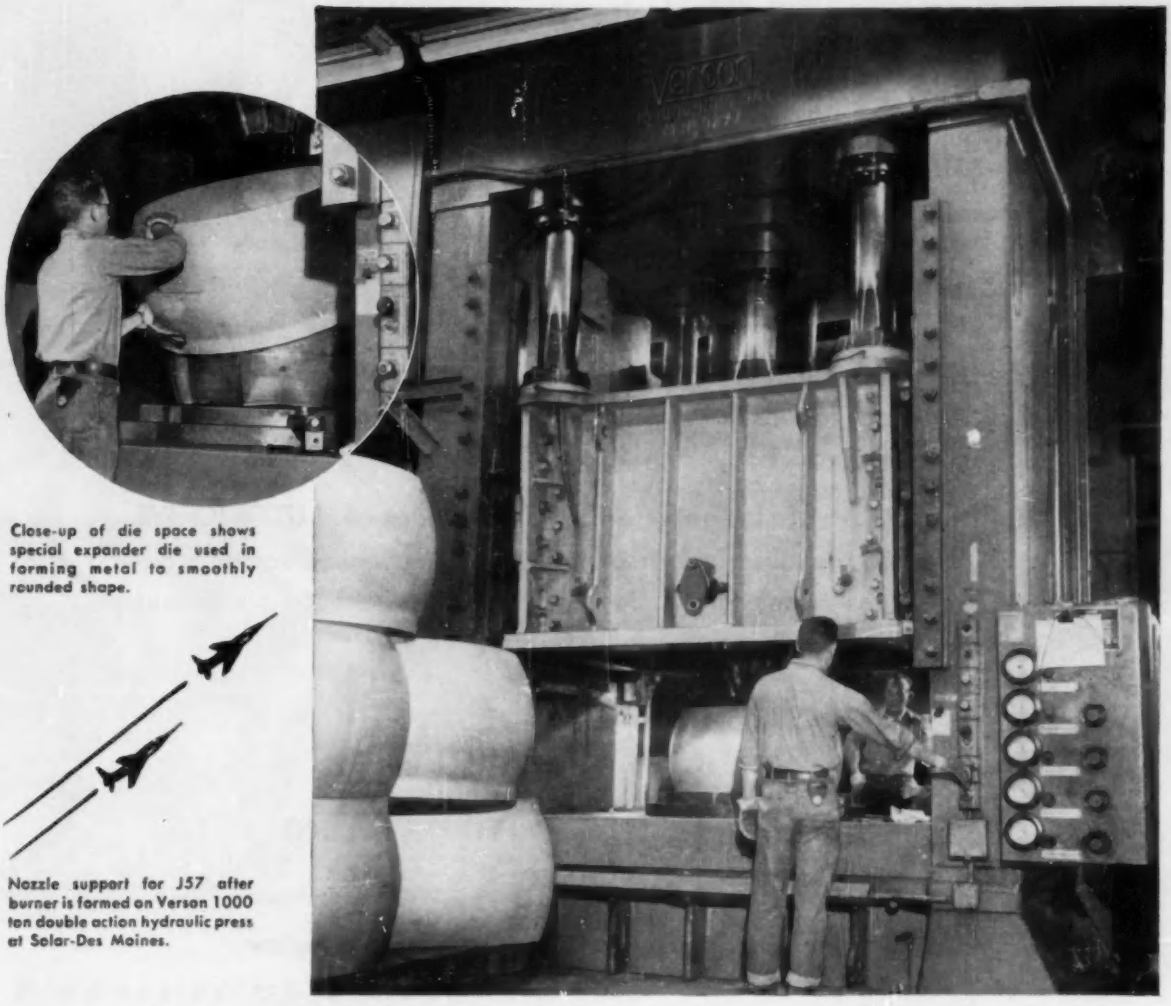
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All analyses .010 in. to ½ in. OD—certain analyses in light walls up to 2½ in. OD

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Close-up of die space shows special expander die used in forming metal to smoothly rounded shape.

Nozzle support for J57 after burner is formed on Verson 1000 ton double action hydraulic press at Solar-Des Moines.

Another "Verson" Press proves its versatility

. . . forming jet engine components at Solar Aircraft Company

This is Verson versatility at work . . . a 1000 ton Verson double action hydraulic press . . . "workhorse" at Solar Aircraft Company's Des Moines plant.

Solar produces components for jet and turbo-jet engines which power a number of our best known aircraft. They are also engaged in the manufacture of components for guided missiles. To this end, a variety of tasks are assigned to this Verson Press, including heavy duty expanding, sheet metal embossing and deep drawing. Forming is done primarily with 300 series or 410 stainless steels, ranging in thickness from .031 to .093.

The double action press, largest of its type at Solar-Des Moines, has proved a rugged and versatile production tool. In addition to the heavy jobs, it handles general production when needed.

Big job . . . small job . . . there's a Verson press for you. For specific recommendations send an outline of your requirements.

A Verson Press for every job from 60 tons up.

"Verson"

ORIGINATORS AND PIONEERS OF ALLSTEEL STAMPING PRESS CONSTRUCTION

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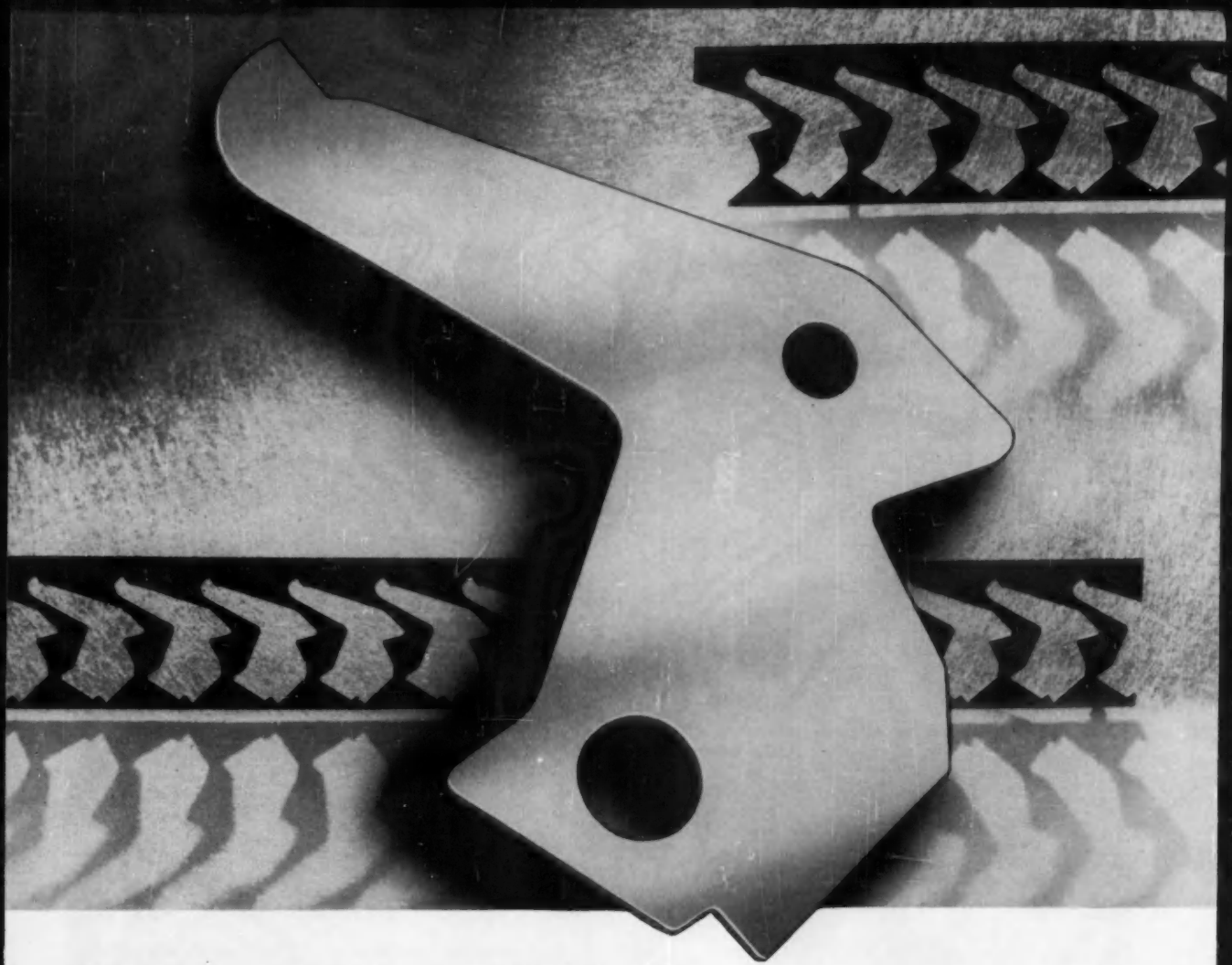
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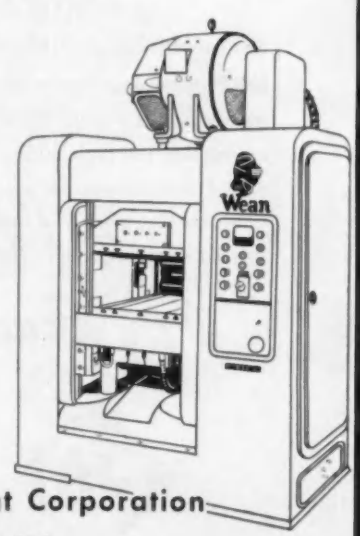
Production up almost 300% on compound pierce-and-blank operation

Production Rate: **Conventional press — 90 pieces a minute**
Wean "Flying Press" — 335 pieces a minute

The piece illustrated above is a circuit breaker cradle stamped out of .064 gauge strip steel. Length of index was 1¼". Involving a compound pierce-and-blank operation, it was produced on a conventional press at the rate of 90 parts per minute at the Westinghouse plant in Beaver, Pennsylvania. Using the same dies in a 60-20-36 "Flying Press", Westinghouse increased production to 335 parts per minute.

Speed, however, is only one phase of the "Flying Press" story. Automatic operation, centrally located controls, greatly reduced maintenance — all combine to make this the most remarkable press development since the turn of the century.

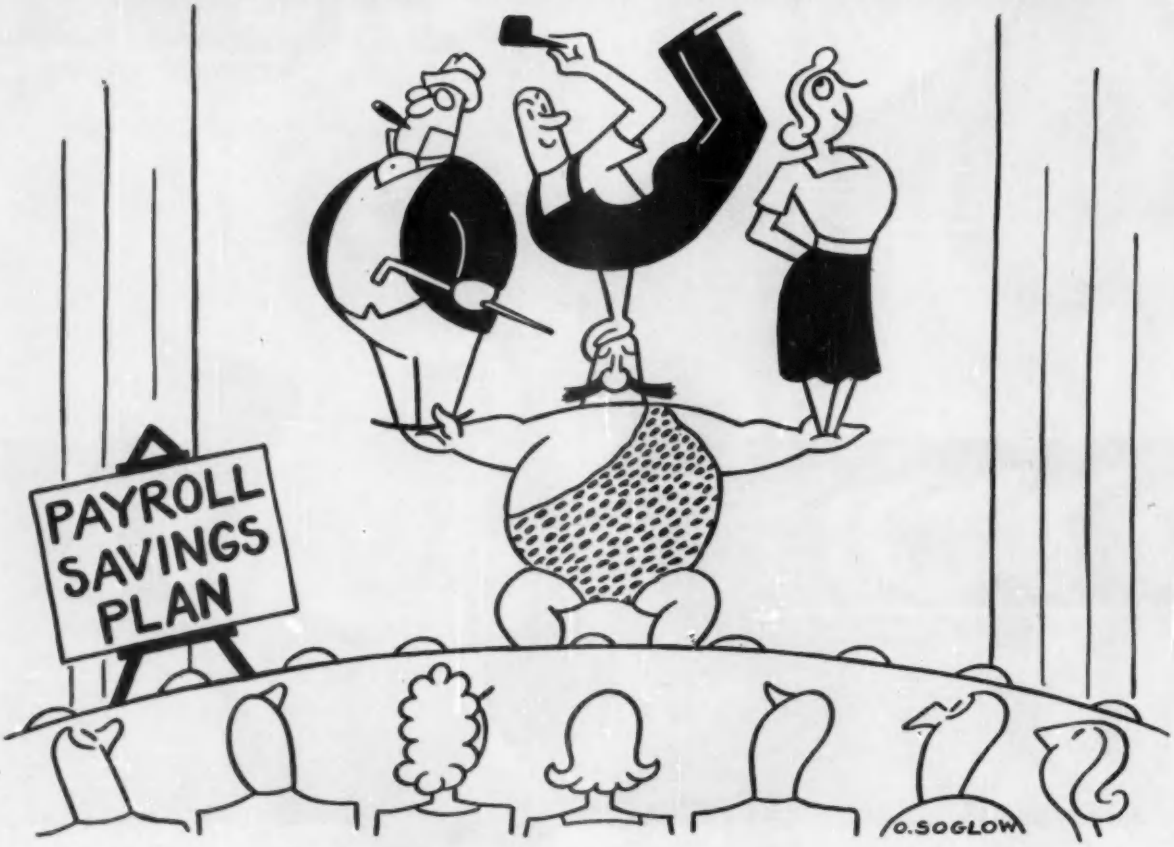
The whole story is covered in detail in the Wean "Flying Press" Brochure. Write for it today.



Wean Equipment Corporation
CLEVELAND 17, OHIO

BLANKING | PROGRESSIVE BLANKING | COMPOUND PIERCE-and-BLANK | PROGRESSIVE DRAWING | PROGRESSIVE FORMING

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Moreover, when you install the Payroll Savings Plan in your company, you promote not only the security of your personnel but the security of your company and your country. Over forty million Americans have over 40 billion dollars invested in United States Savings Bonds—a backlog of purchasing power for the future.

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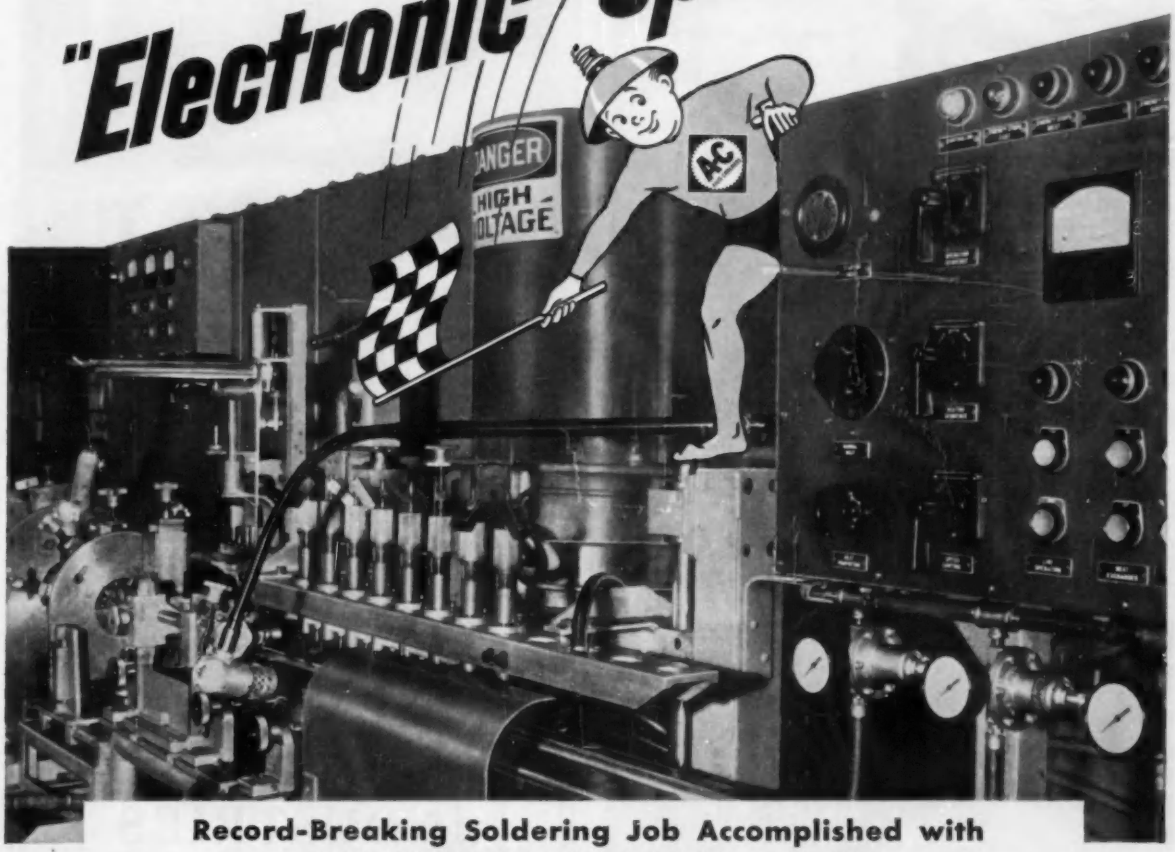
If your company does not now have a Payroll Savings Plan, or if employee participation is less than 50%, a letter to: Savings Bonds Division, U.S. Treasury Department, Washington, D. C. will bring prompt assistance from your State Director. He will provide application cards, promotional material, and as much personal help as you need.

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Sheathes Cable
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"Electronic Speedways"



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In Western Electric's ultra-modern cable sheathing operation, four Allis-Chalmers 50-kw induction heaters at Kearney, N. J., and four identical units at Chicago make up electronic speedways.

Telephone cables 1¼-inch through 3-inch outside diameter race beneath specially designed induction coils which induce heat into the overlapping areas of the corrugated metal sheathing enclosing the cables. Amount of heat induced depends upon cable speed. Voltage-generating tachometers, magnetic amplifiers and saturable reactors control amount of heat supplied by the coils. Heat is accurately controlled through all speed ranges.

Mr. Hi Frequency is ready and able to help you, too

If your job is one of brazing, soldering, hardening, annealing, or melting, it will pay you to get all the facts on induction heating. Contact your A-C representative or write Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wis.

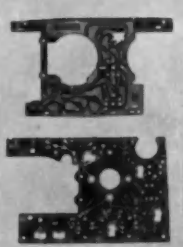
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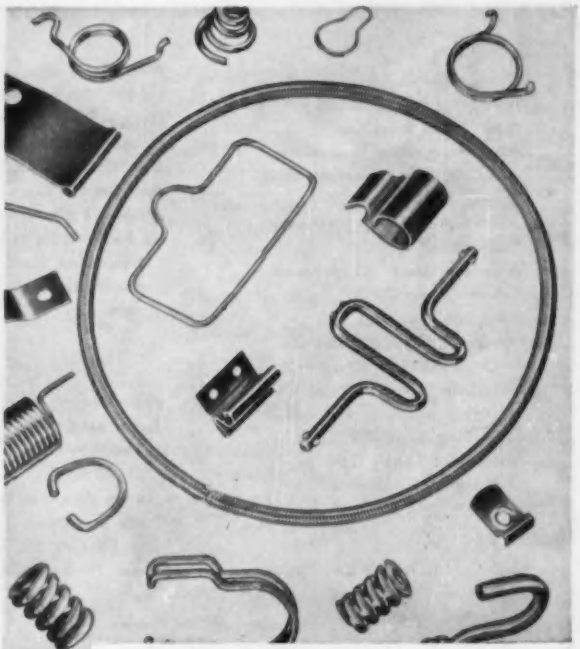
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PAT. PENDING

STOPS PIPE THREAD LEAKS

Satisfaction Guaranteed Or Money Back TRIAL OFFER

TRU-O-SEAL Fittings are guaranteed to seal pipe thread connections permanently against all oils, practically all known chemicals and gases; to seal under high pressures or vacuum; to withstand —280° to plus 500° F.; to eliminate "overtightening" damage and pipe dope. Available in ⅛" to 2½" pipe thread sizes.

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...inch ounces
...inch pounds
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P.A. STURTEVANT CO.
ADDISON QUALITY ILLINOIS



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TEST AFTER TEST PROVES NYLON TIRE CORD GIVES EXTRA STRENGTH FOR EXTRA SAFETY



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The lasting strength and safety of nylon tire cord has been proved in the laboratory and on the highway. Nylon cord withstands the added strains of today's more powerful cars and the sustained speed permitted on superhighways. Nylon cord protects against the four major causes of blowout: heat, moisture, flex fatigue and bruise damage—gives motorists the added safety and dependability they want in a tire.

Nylon cord tires can reduce unsprung weight, and nylon's shock-absorbing toughness can take the additional strains of power steering, power braking and higher horsepowers. Surveys and rising sales show that today's motorists know and want the extra strength and safety of nylon cord tires.

Du Pont produces the nylon fiber.
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Today, the strongest, safest tires are made with nylon cord

CLEAR-O-MATIC*

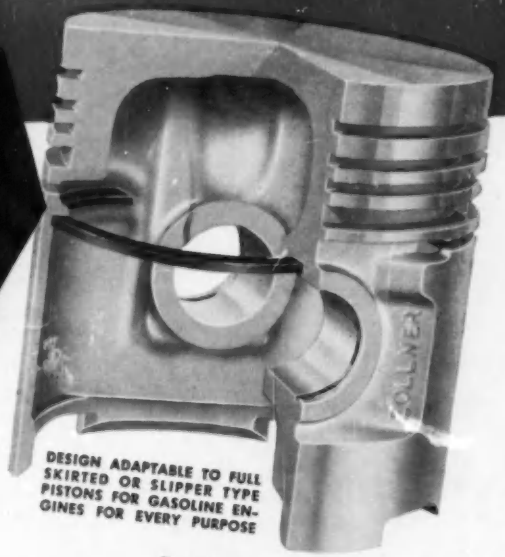
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STEEL TENSION MEMBER

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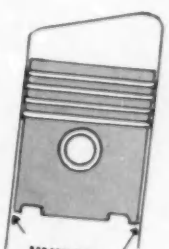
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Sensational Performance

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3. Steel tension member, with same effective expansion as cylinder, maintains uniform skirt clearance through entire temperature range.
4. Normal diametric clearance usually less than .001 with uniform skirt bearing.
5. Durability and conductivity comparable to heavy duty design.

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...Without a Moment's Care!

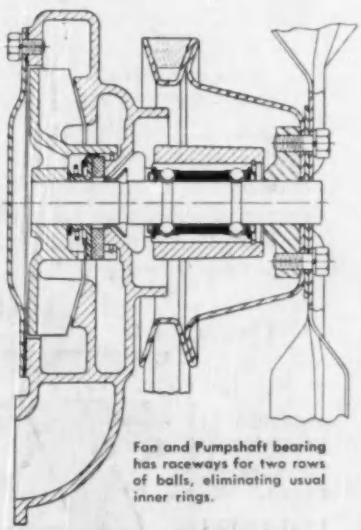
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